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VIEWS, NEWS AND INTERVIEWS.

King Menelik, of Abyssinia, has installed a complete telephone service for the use of his government, and wires now connect the palace with the offices of all heads of departments. Russian electricians got the contract, although English firms worked for it.

It is stated that Claus Spreckels, the sugar magnate, will establish in San Francisco an electric plant that will furnish light, heat and power at very low rates. In accordance with his plans, articles of incorporation of the Independent Electric Light and Power Company, with a capital of $10,000,000, have been filed. The directors for the first year are Claus Spreckels, John S. Spreckels, Adolph B. Spreckels, Charles E. Hume and W. K. Gibson. It is reported that Claus Spreckels will be chosen president of the company, and that it will also enter the telephone business.

Lieut. E. A. Anderson, U. S. N., who commanded the cable-cutting expedition at Cienfuegos last Summer, was captain of the little ex-Spanish gunboat "Sandoval" on her trip from Cuba to the New York Navy Yard, where she arrived April 6. Her commander had, recently, an opportunity to again show the spirit that animated the exploit of cable cutting under fire. While the crew and a force of Cuban workmen were cleaning up the vessel after it had been raised, a plug was knocked out of a hole in the ship's bottom near the engine-room bulkhead. The hole was between two and three inches in diameter, and had evidently been made deliberately and plugged insecurely. The water entered through it rapidly enough to sink the vessel in a very few minutes. The Cubans at work below ran out immediately and started to leave the ship. Lieutenant Anderson, however, went below, grabbed up some cotton-waste and started for the hole. The water was more than waist deep before he found the hole, and the vessel was already settling ominously. He placed the waste in the hole, stamped it down with his foot, and then stood on it until a patch could be put in place from the outside and bolted on.

A cable dispatch from Berlin, Germany, states that Drs. Lang and Meltzing have described an apparatus they have invented for photographing the interior of the stomach. The foremost end of the stomach tube contains a microscopic camera and an electric light. When the stomach is emptied and filled with air the apparatus photographs the most secret recesses. The negative is about the size of a cherry stone, but can be enlarged.

A Pennsylvania trolley company has had to pay a young man $1,200 because its electricity got into a barbed wire fence near the track, and when he took hold of the fence to climb it he couldn't let go until, according to a daily paper, his hand and arm were shriveled!

It is reported that a telephone girl, at Lansing, Mich., awoke one day last week to find herself speechless. The singular feature of the case is that she has experienced no pain or discomfort. The affliction is believed to be the result of too much work at the exchange, and there is a difference of opinion among physicians as to whether the loss of voice will prove to be permanent.

THE BANDOT SYSTEM OF TELEGRAPHY.

BY E. BERNARD.

One of the most important French inventions in the line of telegraphy is the printing telegraph of M. Bandot. This system has been adopted by the French Government, which controls the telegraph system, and lines are now in operation from Paris to Bordeaux and from London to Paris. This apparatus is also in use in other countries of Europe, and the inventor has received decorations, not only in his own country, but from the Emperor of Austria and other sovereigns.

In this telegraph, the characters are printed upon a roll of paper by a type-wheel, the speed of transmission being three characters per second. One of the most valuable features of the invention consists in the sending of as many as six messages at a time over the same wire. In the following description the transmission of a single message will be considered in order to explain the action of the apparatus, and it will be subsequently

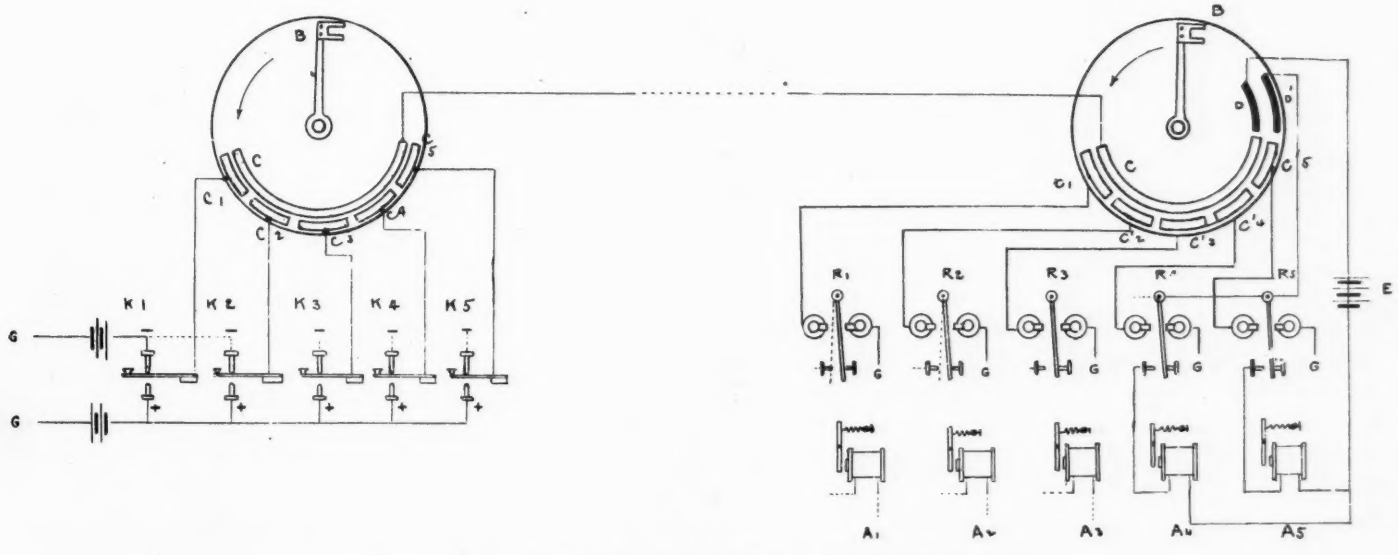

FIG. 1.—DIAGRAM OF CONNECTIONS OF THE BANDOT SYSTEM OF TELEGRAPHY.

shown how the six messages are transmitted at the same time.

The transmitter is provided with contacts C, C_1, C_2, etc., Fig. 1, over which passes the rotating brush B, thus connecting successively the five keys K_1, K_2, etc., to the line L; each of these keys is provided with an upper and a lower contact; the upper contact is connected with the negative pole of a battery, and the lower with the positive pole of a second battery, so that in its normal position against the upper contact, a current in a negative direction is given to the line; upon depressing the key the line receives a positive impulse. The receiver is also provided with a series of circular contacts C^1, C^1_1, C^1_2, etc., to each of which is connected a relay R_1, R_2, etc. It will be seen that if the brush B^1 of the receiver rotates at the same rate as that of the transmitter, the five relays will be connected successively with the five keys of the transmitter, K_1 to R_1, then K_2 to R_2, etc. The armatures of the relays are polarized, and move freely between their right-hand and left-hand stops, taking a position on the right when a negative current passes, and vice versa. Thus, when the keys K are in their normal position, the armatures of all the relays are against their right-hand stops. When, however, one of the keys is depressed, it sends a positive current into the corresponding relay when the brush passes over the proper contact, and the armature of this relay makes contact with the left-hand stop. Below the relays are shown five electro-magnets, A_1, A_2, etc., each of which is provided with an armature which is attracted upon the passage of a current. Each of these electro magnets is connected with a corresponding relay, and, by means of the local battery E, a current may be passed through each electro-magnet when the relay makes contact with the left-hand stop. This current is permitted to pass through the electro-magnets by means of the contacts DD^1, at the end of each revolution of the brush B^1. It will thus be seen that if, for instance, the keys K_1 and K_5 are depressed, the relays R_1 and R_5 take the left-hand position, making contact for the circuits of the electro-magnets A^1, A^5, and at the end of the revolution of the brush these two electro-magnets attract their armatures. In this manner each of the electro-magnets responds to the depression of its corresponding key.

These keys are placed side by side in a special keyboard, the three keys on the right being separated from those on the left by a switch. To transmit the letter A, for instance, key No. 1 is depressed, for B, Nos. 3 and 4 are depressed, giving in each case the disposition of current shown below:

A, + − − − −
B, − − + + −
C, + − + + −
Etc.

Thus, for each letter or character the relays and their electro-magnets

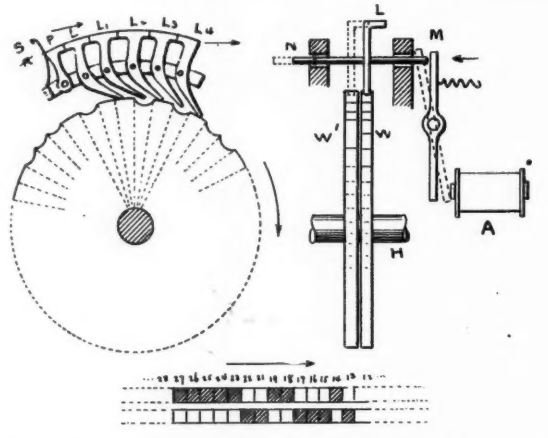

FIG. 2.—BANDOT TELEGRAPHIC SYSTEM—SELECTING APPARATUS.

A^1 A^2 make a certain combination, there being 32 possible combinations for the five keys, and for each revolution of the brush a different character may be transmitted. The brushes of the transmitter and receiver are each caused to rotate at a uniform speed

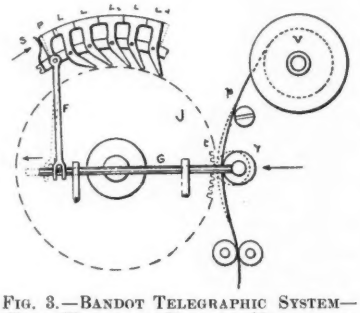

FIG. 3.—BANDOT TELEGRAPHIC SYSTEM—TYPE-WHEEL AND PRINTING MECHANISM.

by two synchronous motors, which will be described below.

It now remains to be seen how these different combinations of keys and of impulses determine the selection of the proper letter upon the printing wheel of the receiver. This is shown in Fig. 2; the levers or "finders" L L_1, etc., are pivoted at their centers, carrying at their upper end a projection by which they rest in contact with one another, and when their lower ends are free, the five "finders" may be given a forward movement together in the direction of the arrow by means of the spring S and the intermediate lever P. However, the lower ends of the finders are not always free to move, as they rest upon the periphery of the notched wheels W W^1, carried by the shaft H, as shown on the right. Each of the finders, with its pivot N, may be slid backwards or forwards, so that its lower part rests either on the wheel W or W^1, without, however, disengaging its upper part from the others of the series. This to-and-fro movement may be given to each of the finders L, L_1, L_2 by its corresponding electro-magnet A and lever M, this magnet being one of the five connected with the relays. The wheels W W^1 carry notches in their circumferences, and a notch on the wheel W falls behind a raised part of the wheel W^1. If we suppose that a certain combination has been made by the five keys, say + − + − +, the three finders corresponding to the sign + are pushed over into the second position by the electro-magnets A A, etc., and there are thus two levers upon the wheel W and three upon W^1. The 32 divisions of each wheel are so arranged that there is one point in the revolution in which, for a given combination of the fingers, the lower end of each is allowed to fall into a notch at the same time; at this instant they may be moved together by the spring S in the direction of the arrow. This movement causes the impression of a certain character by the arrangement shown in Fig. 3. The type-wheel J is mounted on the same shaft as the notched wheels W W^1, and carries the raised letters *t*. The roll of paper carried upon the drum V passes over the roller Y, which is capable of a to-and-fro movement by means of the sliding shaft G, so as to come into contact with one of the raised types. This sliding shaft is connected with the lever P by means of the rod F, and it will be seen that when the notched wheels come into a given position the fingers are depressed, and a movement is given to the lever F by the spring S, by which a certain character is printed upon the paper.

In Fig. 2 the electro-magnets A have been represented as acting directly upon the fingers; this is in fact accomplished indirectly by means of a cam upon the shaft H, which at a certain moment engages with those of the levers M, which have been previously attracted, and this cam pushes the corresponding fingers into position.

It is necessary that the brushes of the transmitter and receiver should revolve upon their contacts at exactly the same rate of speed. To obtain this result each is provided with a small motor of the Siemens type. These motors are so constructed as to revolve as nearly as possible at the same rate, being each provided with a speed regulator of the centrifugal type. The final correction is obtained by a special device, in which at each revolution an impulse is sent over the line, which, by means of an electro-magnet, acts upon the mechanism of the receiver, causing its speed to be slightly altered if necessary. In fact, by this means synchronism is obtained to a sufficiently exact approximation for the purpose required. At the receiving station the printing apparatus, instead of being operated by the same motor which rotates the brush, is provided with a separate motor, whose speed is regulated, so as to be in accord with the former, by means of an electric brake. The speed of the second motor is slightly higher than that of the first, and the brake is arranged so as to give the necessary retardation.

In order to enable the operator to transmit a signal at each revolution of the brush, the keyboard is provided with an electro-magnet or "striker," which gives a sound or tap at the end of each revolution, thus indicating to the operator the proper instant to depress the keys. It should be mentioned that, in reality, the apparatus by which the paper is brought into contact with the type is much more complicated than is shown in Fig. 3, this being merely a diagram. The roller Y is so arranged that at each impulse a fresh portion of paper is brought opposite to the type.

In Fig. 4 is shown the general disposition of the revolving brush and

contacts, and also the arrangement by which six messages may be sent over one line. In the figure the contacts are shown for but four messages, to avoid complication. The five contacts for the first instrument are shown at C, being the five described above. These are immediately followed by the five contacts of the second instrument, and this second series by a third, etc. It will be seen that, at every revolution of the brush, the contacts of the four transmitting instruments are successively connected to the line by the brush, supposing the line to be connected with the central ring R. The receiving station is provided with a similar series of contacts, and, as the two brushes of each instrument rotate at exactly the same speed, each of the contacts of the transmitter is connected through the line to its corresponding contact of the receiver, thus permitting each impulse to be sent into its corresponding relay.

In the actual instrument a number of other contacts are employed, which have been suppressed in the figure to avoid complication. The two contacts A A^1 are used for the correction of the synchronism, by means of an impulse sent from the receiver to the transmitter. This current acts upon the rotating mechanism of the brush of the receiver in such manner that an adjustment of synchronism occurs twice in each revolution, thus insuring the accurate working of the instrument.

Railway Companies After a New York Lighting Plant.

The ELECTRICAL REVIEW is informed that representatives of the Third Avenue Railroad Company and the Manhattan Railway Company on the one hand, and the Metropolitan Street Railway Company on the other hand, are endeavoring to secure control of the United Electric Light and Power Company, of New York city. The recent traffic agreement entered into between the Third Avenue and the Manhattan companies makes these two an unusually powerful competitor of the Metropolitan company. It is understood that the franchise of the United Electric Light and Power Company is such as to make it very desirable to any railway company which may have surplus electric current to dispose of commercially. At the time of going to press it was understood that the deal had not been closed, but that one or the other of the street-railway companies will probably in the end secure the United company's franchise and plant, with the chances favoring the Third Avenue Railroad Company.

It is understood that one of the officials of the United Electric Light and Power Company has secured a call on about 95 per cent of the stock of the company, good until July 1, at $40 per share for the common and $50 per share for the preferred stock.

Protection of Gutta-Percha Trees.

M. Adolphe Combanaire, a French engineer, has just set out for the Malay peninsula to explore the gutta-producing regions. He will return in about one year, and will then communicate with the principal governments and cable companies in order to bring about an international congress, at the forthcoming exposition in Paris, to decide upon measures for the protection of the few remaining gutta-percha trees. These trees are rapidly being destroyed, and their disappearance will not only make new submarine cables out of the question, but also prevent the replacement of those now in service.

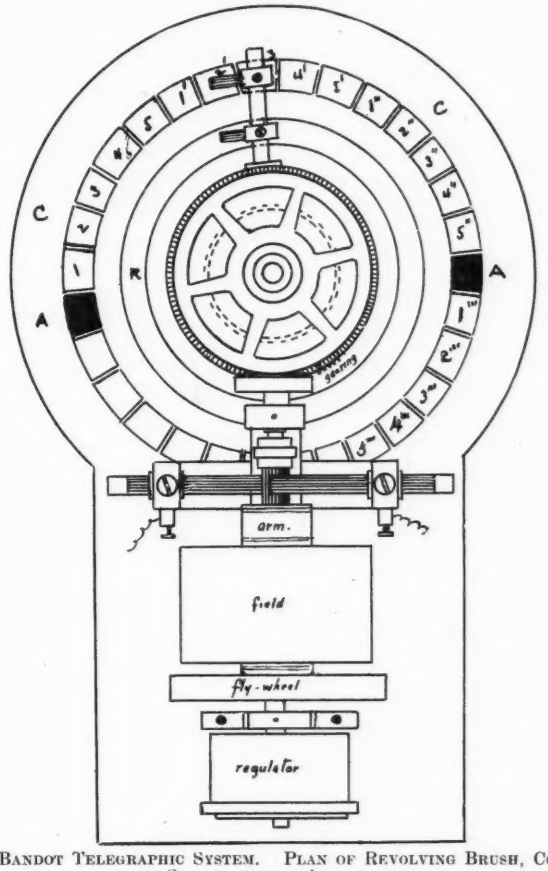

FIG. 4.—BANDOT TELEGRAPHIC SYSTEM. PLAN OF REVOLVING BRUSH, CONTACTS AND SYNCHRONIZING ADJUSTMENT.

Simultaneous Telegraphy and Telephony.

The Delaware, Lackawanna & Western Railroad Company has recently been operating telephones over a telegraph circuit, connecting its New York offices and various points in New Jersey. Although the circuit necessarily includes a considerable length of cable, no difficulty was experienced in operating both the telegraph instruments and the telephones at the same time. It is likely that this arrangement will be retained for permanent, practical use.

Important Movement in Electrical Manufacturing Circles.

Mr. Samuel Insull, president of the Chicago Edison Company, has bought the greater portion of Mr. S. Bergmann's interest in the General Incandescent Arc Light Company, of New York, and will actively enter the field of electrical manufacture. He has also purchased the New York Electrical Equipment Company, which is to be operated under the same management, doing a general construction business and extending its operations throughout New England and as far west as Pittsburgh. The General Incandescent Arc Light Company will continue manufacturing as before, covering the field of smaller specialties, and will also make different sizes of dynamos and motors. The lines of minor articles needed by illuminating companies and their customers will be a special feature of this company's manufacture. The Paragon motor interests will be developed thoroughly and energetically; also the Wright discount meter, which is in great demand, will be manufactured at the large factory in New York. Mr. Insull will also manufacture an incandescent lamp known as the "G. I." Mr. Insull's two brothers will be associated with him in the management of these different interests, and the officers of the General Incandescent Arc Light Company are Mr. Samuel Insull, president; Mr. S. Bergmann, first vice-president; Mr. Martin J. Insull, second vice-president, and Mr. P. H. Klein, secretary and treasurer, all well known gentlemen in electrical circles.

Another important move by Mr. Insull is the association with Mr. Frederic Nicholls, of the Canadian General Electric Company, of Toronto, Can. These gentlemen have taken hold of the Fischer Equipment Company, of Chicago, a company which has recently, and with much success, entered the field to manufacture electric vehicles. Mr. Samuel Insull is to be president of this company and Mr. Nicholls vice-president. Plans will be made for manufacturing on both sides of the Lakes, and a very large output is naturally expected, as the inquiries are very large. The Chicago Electrical Vehicle Company has been formed with a subscribed capital of $2,000,000, the incorporators being Mr. E. L. Brewster, banker; Mr. W. G. Beale, former corporation counsel of Chicago, and Mr. Insull. The level streets of Chicago will prove particularly well adapted for the use of this modern transportation vehicle.

When seen by a representative of the ELECTRICAL REVIEW, Mr. Insull stated that he proposed to work along the lines he inaugurated with the Edison General Electric Company. Agencies will be established in different cities, and a great many influential affiliations have already been arranged for. The large factory building on Thirty-third street and First avenue, New York, will be the eastern headquarters, and the downtown agency at 39 Cortlandt street will be continued.

Mr. Insull further stated his positive intentions to remain the head of the Chicago Edison Company, and said that there were no negotiations pending relating to the sale of the Edison company to Chicago gas interests, as had been reported previously.

The Mohawk River Telephone Company.

The Mohawk River Telegraph and Telephone Company has been incorporated, with a capital of $21,000, to operate a telephone and telegraph system from Syracuse to Albany, N. Y., by the way of Oneida, Rome, Utica, Little Falls, Fonda, Schenectady and other intermediate points, and to extend its lines to northern New York and east through the New England states to the Atlantic seaboard, and south into New Jersey and Pennsylvania.

The Moving Walkway of the Paris Exposition.

One of the most remarkable attractions, and at the same time one of the greatest conveniences, of the forthcoming exposition at Paris will be the vast moving platform, or walkway, which will almost surround the grounds. It will be remembered that this method of transportation was adopted after an examination of several schemes which were suggested. It is intended to form an important part of the transit facilities of the exposition.

In order to satisfy the exposition authorities of the practicality of the moving platform, a trial section was erected at Clichy and recently tested. On a steel trestle-work, about seven feet high, were laid two parallel tracks, of two rails each, one of 19½ and the other of 48 inches gage. A succession of four-wheel trucks, covered with a platform overlapping at the joints constitutes the walkway proper, the total length of the trial section being 1,288 feet. This was arranged in an elliptical form, having curves and grades corresponding to those that will be encountered in the full-size walkway on the exposition grounds.

There are two platforms, side by side, on the structure, moving in the same direction at two and one-half and five miles per hour respectively. At these speeds there is said to be no difficulty in stepping on or off the platforms. The following description refers to the experimental section at Clichy, but the same material will be used in the longer section to be erected on the Champ-de-Mars.

The platforms are driven by 27 motors, arranged at equal distances apart upon the stationary trestle-work, and under the walkways proper. The illustration clearly shows the arrangement. Each of the trucks composing the moving structure carries, on its lower part, an axial steel beam, whose lower edge is bulb-shaped and rests upon the large wheels G of the motor-driving machinery. These wheels, which are driven by double-reduction gearing, support the greater part of the weight of the platform, the whole equipment of motor, gearing and wheels being hinged at O and forced upward by the leaf spring R. The four flanged running-wheels of each truck serve simply as guides. The arrangement, as shown, drives the high speed platform. A precisely similar set of drive-wheels, of half the diameter of those shown at G, is connected by universal joints to the axles of the latter, and drives the low-speed walkway. In the experiments at Clichy, the weight of the moving parts of the apparatus was about 200 tons.

For these trials three-phase induction motors were used, but in the exposition structure these will be replaced by direct-current motors in order to make the work of starting the platforms easier.

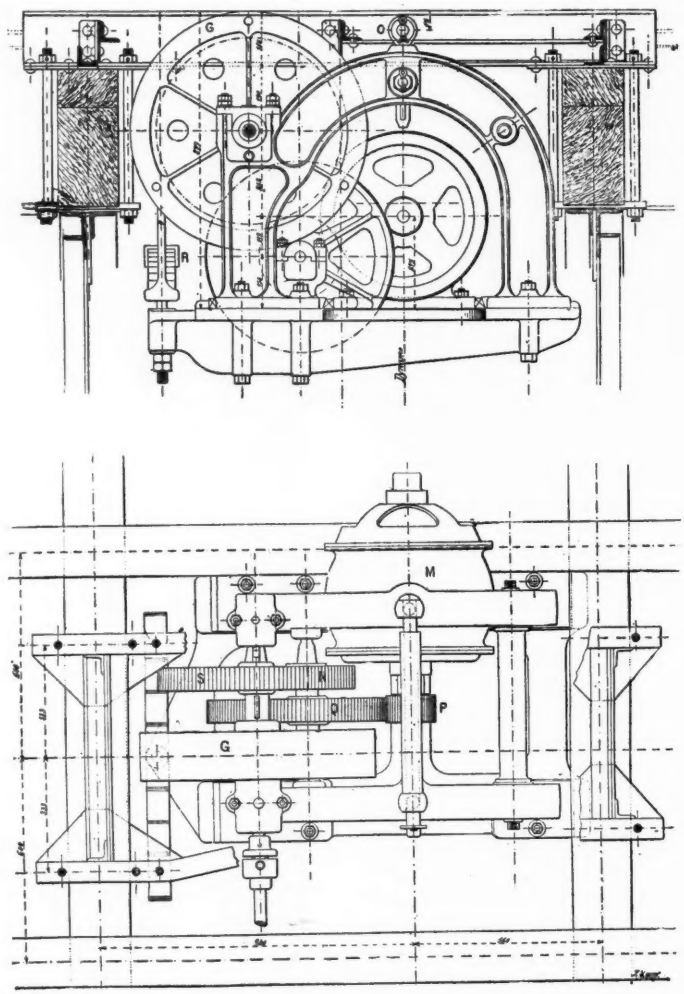

FIG. 1.—ELEVATION AND PLAN OF MOTOR EQUIPMENT FOR PARIS MOVING WALKWAY.

While somewhat similar moving walkways were shown at Chicago in 1893, and Berlin in 1896, neither were more than models in comparison with the remarkable structure to be built in Paris. The illustration shows a plan view of the part of the grounds encircled by it. Its total length will be about two miles, and its capacity 32,000 passengers per hour. A special generating station will be built to furnish power to the 200 motors which will be mounted under the platforms. The weight of the moving parts will be (without passengers) about 2,000 tons. Twelve stations will give access to the walkway, and at the most important of these there will be moving staircases.

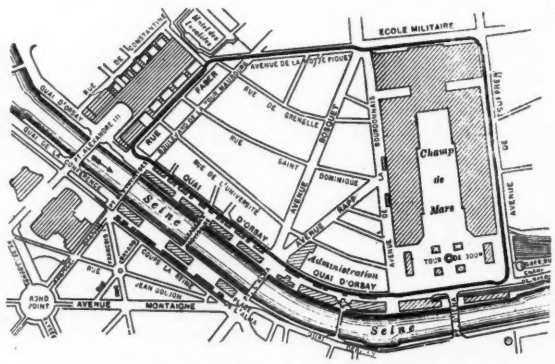

FIG 2.—PLAN OF PARIS EXPOSITION MOVING WALKWAY.

The Telephone Business in the United States.

Few industries have grown so fast or so surely as the telephone exchange business. The credit which the invention for the exchange system deserves is generally ignored, but, in some ways, the idea of the central bureau for telephonic connections was as important as the conception of the telephone itself. It made possible the vast convenience which has become a necessity; it decreased the lost time of commerce to the enormous benefit of all industry.

It is hard to realize the present extension of the telephone. From the nineteenth annual report of the American Bell Telephone Company, an idea may be had of both the growth and extent of the systems of this one company, and the result is startling.

The total number of stations connected in the 2,134 exchanges and branch offices, is no less than 465,180. The total length of wire connected is 772,989 miles — enough to furnish three lines from the earth to the moon, with a scrap left over long enough to build 10 circuits from New York to Manila. If a pole line were built around the earth at the equator for this wire it would require 31 insulators on each pole. At the latitude of New York, this mass of telephone wire would girdle the earth 41 times, and if the stations were equally spaced on it they would be only 200 feet apart.

At each station is a magneto generator, having an output of about eight watts as ordinarily manipulated. If all were properly connected together, and turned at the same time, the result would be the generation of 2,790 electrical horse-power—enough to light a large city or to keep five heavy express trains in motion.

The estimated number of calls per year is 1,231 million. This means, assuming a population of 75,000,000, that, on the average, every inhabitant of the United States uses the telephone about once in three weeks.

Perhaps the best idea of the enormous number of calls is obtained by remembering that it would keep 71 men working eight hours a day and counting 100 numbers a minute, to keep count of them. The daily calls average 3,822,070, or 133 per second during the eight hours of the working day.

While these figures are surprising, they would be of little significance beside those that would represent the value of the telephone to the public, could they be obtained. And it is to be remembered that the facts set forth above are not for the total telephone business of the country, but only for that conducted by one company.

Lightning Phenomena and Building Protection.

A practically untrodden field of scientific research has been disclosed within the past month by a lecture first given at Columbia University before the New York Electrical Society, and later at the Art Building, Brooklyn, under the auspices of the Brooklyn Institute of Arts and Sciences. We refer to the copiously illustrated discourse of Mr. W. J. Jenks, E. E., on "Modern Research into Lightning Phenomena and Building Protection."

We do not overlook the fact that the development of photographic apparatus, particularly of amateur outfits and rapid plates, has stimulated the capturing of images of lightning flashes during the past 15 years or more; nor that occasional publications of unusual flashes by enthusiastic artists or meteorologists have attracted much attention to the curious illustrations which have accompanied them. These have been largely fugitive and disconnected. Only one or two societies and a half dozen individuals have really collected photographs showing any variety of effects in a field where Nature seems to be as prolific of types as in the vegetation of the virgin forest.

Mr. Jenks has shown in the lecture about 75 lantern slides of lightning flashes, many of which are of surpassing beauty. This is, so far as we know, much the largest collection in this country. He has roughly divided them into several groups, some of which have reference rather to their impression upon the camera plate than to their distinctive characteristics; others indicating basic peculiarities. Among these groups are "flashes between clouds," "between clouds and to earth," "impulsive rushes," "meandering discharges," "sailing bolts," "oscillatory discharges," "ribbon flashes," "beaded or chain lightning."

Judging from the frequency with which less than half a dozen names appear in the running notes of the lecturer on these pictures (W. N. Jennings, of Philadelphia; William Archibald, of Newark, and Alexander McAdie, of the Weather Bureau), it appears that in this field the really successful artists, in this country at least, are very few in number. With the growth and prosperity of a large number of camera clubs all over the United States, it would seem that intelligent effort ought to contribute much during the next few years to the sum of our knowledge of the apparent vagaries of the thunderbolt.

As an illustration of this idea, we give below an extract from a letter written by Lord Kelvin within a few weeks, and shown upon the screen during the lecture as an incentive to electrical students and amateur photographers to give intelligent attention to this fascinating subject:

No. 12 Grosvenor Gardens,
London, February 24, 1899

DEAR MR. JENKS: Your letter of the 7th, with inclosure, followed me to London, where I have been for a few days. * * *

I am afraid I can not suggest any ideas regarding electric flashes through air or gases, which are not already known to you and of general currency. As to multiple flashes, you

A TROPICAL THUNDERSTORM. PUERTO CORTEZ BAY, HONDURAS, CENTRAL AMERICA. FROM THE COLLECTION OF MR. JENKS, BY COURTESY OF T. H. MCALLISTER, WHO RECENTLY SECURED THE ORIGINAL NEGATIVE. TAKEN ABOUT 9 P. M.; EXPOSURE 31 MINUTES. ARTIST UNKNOWN.

will find in *Nature* for October 13, 1898, an exceedingly interesting photograph by Mr. Strohmayer, which he gave for publication on my suggestion. It may possibly be three successive partial discharges in the same direction, or possibly (more probably ?) an oscillatory charge that is represented. * * *

I remain, yours truly,
(Signed) KELVIN.

From the article in *Nature*, to which Lord Kelvin refers, we make the following brief extract:

"At the suggestion of Lord Kelvin, I send you the enclosed photograph of a triplet lightning flash which was taken during a recent thunderstorm at Whitby, and under the following conditions.

The flash must have been about two miles distant (out at sea). The focus of the camera lens was eight inches; the aperture, $\frac{1}{64}$th; the plate, Ilford Empress. The camera was not stationary, but was purposely oscillated by hand. It was intended that its axis should describe a circular cone, but from the photograph the path appears to have been rather elliptical. Each revolution occupied about $\frac{1}{80}$th minute. From these rough data I estimate that the three flashes followed each other with a frequency of about 30 to 35 per second."

To even summarize the interesting queries raised by this lecture would occupy considerable space. Mr. Jenks quotes some theories of others, but disclaims any intention of indulging at present in theories of his own to explain several of the remarkable records of (apparently) oscillatory, whirling and ribbon discharges which his slides exemplify, and only approves such notice of his remarkable collection as shall stimulate further effort, with which he desires to heartily cooperate.

The Landslide on the Gorge Road at Niagara Falls.

The Niagara Falls & Lewiston Electric Road, the line which runs through the Niagara gorge from Niagara Falls to Lewiston, will have a greater amount of rock to remove from its tracks this Spring than it has ever had before. This is owing to an avalanche of rock that fell on the tracks from the cliff on the morning of Friday, March 31. The location of the fall was just south of the Buttery Whirlpool Rapids elevator, where the bank has a sheer descent of 200 feet. The mass of rock that fell came from the top and struck the roadbed with terrific force, smashing the rails and piling up in the form of a small mountain. The buildings at the foot of the new elevator shaft were wrecked, one or two being entirely demolished. It will be recalled that one of these buildings had just been rebuilt, having been destroyed by the fall of an old elevator shaft during a high wind some few weeks ago. In addition to this about 40 feet of the foot of the elevator shaft was carried away, and it was impossible to operate the cars. This elevator is

THE GREAT LANDSLIDE ON THE TRACKS OF THE GORGE ROAD AT NIAGARA FALLS, NEW YORK.

the property of the Gorge road. Following the fall of rock, an examination of the place from whence it fell at the top of the bank revealed the fact that another large piece of the bank was gradually breaking away and preparing to fall. It was decided to remove it, which was done, the additional mass of rock piling up on that which had already fallen. The ledge where the rock fell has always been deemed a solid spot, but the disintegration of the shale beneath the limestone no doubt caused it to break away. Recently there has been heavy blasting in the vicinity of the fall, and this may have had a little effect in loosening the rock. It is the general belief that had the avalanche occurred at a later hour in the day loss of life would have resulted, for many people view the rapids daily from this point.

Nernst Lamp Figures.

The *Elektrotechnischer Anzeiger* is responsible for the statement that the incandescing rod in a 400-volt Nernst lamp should be about one and five-eighths inches long. The cost of lamps is stated to be about $5 each, for sizes to replace ordinary arc lamps. The efficiency is from 1.5 to 1.6 watts per candle, lying between those of arc and incandescent lamps. The color of the light is whiter than that of the glow lamp, approaching that of the arc. The life of the rods is about 500 hours and their renewal is said not to be costly, but the price of renewal is not stated. As to fire risk, the Nernst rod is as hot as an arc carbon, its temperature being about 3,000 degrees centigrade. Lamps as small as 20 candle-power can be made for 400-volt circuits.

Telegraph Communication in the Philippines.

The War Department, upon investigating the telegraph lines of the Philippine islands, finds that they are much more extensive than is generally known. There are between 1,500 and 2,000 miles of submarine and aerial routes in the archipelago.

The cable line from Manila to Iloilo runs through a sea sprinkled with small islands, and lands at a seaport called Capiz, on the north shore of the island of Panay. Thence a land-line crosses the island to Iloilo. A British company laid the cable, but was forced to abandon its working. The same cable system extends on southward to the islands of Negros and Cebu. Land-lines connect the cable terminals with various important towns, and when this telegraph system is in the hands of the Signal Service officers it will be of invaluable assistance.

There are two cables from the island of Luzon to Hong Kong, one from Manila direct, and the other from Bolinao, on the west coast of the island. The latter line is now abandoned.

Electrical Review

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Electric automobiles seem to have come to stay, but, so far, their designers have been so busied with the engineering features of their task that they have neglected the æsthetic side of it altogether. Practical and useful as the automobile may be, even its best friends do not dare to claim that it is beautiful. There have been several prize competitions for speed, endurance, etc., in these vehicles. Why not an automobile beauty show? It couldn't do any harm, and, somehow, it might work to alleviate the distressing ugliness of these most fin-de-siècle machines.

It has been announced that the Long Island Railroad is reserving $8,000,000 of its proposed issue of $45,000,000 of bonds for the electrical equipment of its lines. If this is true (and it most likely is), this railway company is to be congratulated upon its preparedness. The operation of suburban lines by steam is an expensive anachronism, as many railroads have been taught by competing trolley lines. It is to be hoped that the Long Island system will soon issue its reserve of bonds, and give a practical demonstration on a large scale of the fitness of electricity to replace steam in suburban service.

The moving walkway of the Paris exposition, which is described in another column, is an ingenious device, highly novel in its conception and calculated to afford a good deal of amusement to those who stand and look at people getting off and on. Why it should have been selected for actual use—as, indeed, the principal feature of the system of intercommunication in the grounds, is hard to see. The gymnastic exercise it will afford will doubtless be good for the Parisians, and it is practically sure to become the fashion to ride (or walk) on this latest freak of engineering, but what will happen if it breaks down anywhere? There is a considerable amount of stored energy in 2,000 tons of platforms running at five miles per hour, and a broken wheel or axle, a derailment, or any of the countless accidents that may happen, would surely result in piling up many yards of the walkway in a wreck. The speed is too low for this to involve much personal danger, but such an accident would mean a long stoppage of an important auxiliary of the exposition.

LIMITATIONS OF WIRELESS TELEGRAPHY.

Wireless telegraphy, as it is called, seems to be, just now, the fashion. It is worth while to call attention to the limitations of the Hertz wave, and to its extremely restricted range of application in view of the popular interest evoked by recent spectacular experiments.

The method used is of the simplest. The rapidly oscillating discharge of a small condenser sets up a series of waves in space, in all respects precisely similar to light waves, except that their vibration periods are longer and that, for this reason, they produce no visible effects. The transparency, as we ordinarily know it, of some substances is different for these waves, hard rubber, for example, being quite easily penetrated by them.

The outrush of waves shines away, so to speak, into space, suffers the usual reflections, refractions, dispersions and absorptions, and finally reaches the electric eye or "coherer"—a tube filled with metallic filings. The precise *modus operandi* of this is not definitely known, but its electrical resistance is lowered, and a battery and relay in circuit with it enable the influence of trains of electric waves to be noted. Thus signaling is accomplished.

Now, it is perfectly evident that very nearly the same rules that would apply to flash or heliostat signaling are in force with the new variety. The electric waves move in straight lines. It is true that a cloud, or a fog, offers no more appreciable resistance to them than does dry air. But this advantage is offset by the consideration that, in any system of Hertz-wave signaling, the stations—or some part of their sending and receiving circuits—must be "in sight" of one another. To some degree diffraction and other phenomena come into play and help to bend the electric rays around the bulging contour of the earth and other obstacles, but in the main they travel in straight lines. Wave signals, in short, can not be exchanged between stations where flash signals may not be exchanged, except in special cases. If one made a great light in New York he would naturally put it at a great elevation if he wished it seen in Chicago. A rough calculation shows that, leaving out of account the refractive power of the air, flash signals could only be exchanged between these two cities from towers in each about 15½ miles high!

It is to be regretted that the recent elaborate experiments with open-slot conduit traction in this country were confined to direct-current systems. The induction motor is very nearly an ideal machine for railway work, and the conduit is perfectly adapted to carry the three conductors needed with a polyphase system. We are building and operating miles of conduits, and running over them thousands of motors, every one of which has a commutator. Meanwhile, in Switzerland, polyphase motors "as simple as grindstones" are showing satisfactory results on some of the most difficult railways in the world.

A news cablegram from London says that Mr. Marconi's defenders "point out, as a complete refutation of the views of Mr. Tesla, that the Marconi apparatus in the engine-house of the South Foreland lighthouse is next to a room containing an unusually large induction coil, which is used in connection with the 4,000-candle-power light in the lighthouse, and that this coil does not affect in the slightest degree the transmission of messages to and from France. Moreover, they say that a number of steamers with induction coils aboard, used in connection with their electric lights, are constantly passing up and down the channel without affecting the messages." The views here referred to are that the operation of an induction coil anywhere in the neighborhood of a Marconi receiver will affect the latter.

Is it possible that they have mistaken a transformer for an induction coil? Nobody ever said that an ordinary, low-frequency transformer would affect Hertz-wave apparatus; but while a transformer is an induction coil, in one sense of the word, it is not a spark coil—nor is the latter used in electric lighting.

United States Commission to the Paris Exposition of 1900.

To the Editor of Electrical Review:

For the benefit of the industry which you represent will you please state that all who desire to exhibit in the Paris Exposition of 1900 are requested to immediately notify this office, if they have not already done so, in order that they may be considered in the allotment of space which will soon be made. While there are many applications on file in every line of industry, it is desirable that the American sections be not only representative of this country, but also represent the largest possible number of producers. Both our commercial interests and national pride demand that our works be entered in this most important international exposition. It is estimated that fully 60,000,000 people from every part of the globe will attend, and it will be an opportunity to greatly increase our foreign trade and to demonstrate that the United States is supreme in the arts of peace.

Respectfully,

John H. McGibbons,
Director of Exploitation.

Approved:

Ferdinand W. Peck,
Commissioner-General.

Chicago Offices, April 4.

Wall Street and the Electrical Stock Market.

The feature of the market this week was the collapse in industrial stocks on Friday. Competent critics seem to think that this marks the end of long and reckless speculation in these stocks. Nearly the whole industrial list was affected except General Electric, which maintained considerable steadiness throughout the raid. The crash in industrials was caused by the stringent money market, which, it is believed, was brought about by the bankers as a means of checking wild speculation. After the publication of the bank statement to-day, which was regarded as favorable, there was a rapid advance in prices. The market closed the week active and feverish.

On the New York Stock Exchange General Electric closed to-day at 114¼ bid and 116 asked, a loss of one point for the week. Metropolitan Street Railway, of New York, closed at 247 bid and 249 asked, a loss of 16½ points for the week. Third Avenue Railroad, of New York, closed at 222 bid and 226 asked, marking no change for the week.

On the Boston exchange American Bell Telephone closed at 353 bid and 355 asked, a loss of 15 points for the week. Erie Telephone was not quoted to-day.

On the Philadelphia exchange Electric Storage Battery common closed at 180½ bid and 187 asked, a gain of 28 points for the week. Union Traction closed at 40 bid and 41 asked, marking no change for the week.

On the curb or outside market in New York Electric Vehicle closed at 140 bid and 145 asked. Electric Boat closed at 32 bid and 35 asked.

Wall Street, April 8.

Space Telegrams from Paris to London.

A press telegram says that in view of the success of the experiments with the Marconi system across the Strait of Dover, the authorities propose to attempt to transmit messages to England from Paris. The terminal in that city will probably be the Eiffel Tower, the distance to the South Foreland lighthouse being 230 miles.

PERSONAL.

Mr. R. B. Corey, of New York city, spent several days of last week in Boston.

President Phillips, of the Elwell-Parker Electric Company, Cleveland, Ohio, was in New York city last week.

Mr. Arthur Warren, who has been abroad for some months on a special mission for the Westinghouse Electric and Manufacturing Company, returned to New York a few days ago.

Mr. Waldron Hoppins, who has been connected with the New York & New Jersey Telephone Company, of Brooklyn, N. Y., for a number of years, has been elected secretary of the company.

Mr. N. F. Alston is now the vice-president and general manager of the General Electric Automobile Company, of Philadelphia, Prof. W. D. Marks having retired from all connection with the company.

Mr. W. D. Sargent, vice-president and general manager of the New York & New Jersey Telephone Company, of Brooklyn, N. Y., has returned from a brief vacation spent in Florida, looking the picture of health.

Mr. Luther Stieringer has received from the management of the Trans-Mississippi and International Exposition, held at Omaha last Summer, a very handsome gold medal as a mark of appreciation of his work as consulting electrical engineer. In the letter accompanying the medal the director said: "You gave us for six months an earthly paradise, and made us doubt whether the heavenly one could be more beautiful."

A NEW AND POWERFUL ELECTRIC STORAGE BATTERY COMPANY.

THE "WILLARD" BATTERY, OF CLEVELAND, SAID TO BE BACKED BY A STRONG SYNDICATE, INCLUDING LEADING CENTRAL STATION MEN—CONFIRMED BY PRESIDENT INSULL, OF CHICAGO EDISON COMPANY—ELECTRIC VEHICLES TO BE SUPPLIED WITH "WILLARD" BATTERIES.

Negotiations have been in progress for some weeks toward the formation of a large company to enter the field as manufacturers of storage batteries, using as a basis the patents which are now controlled by the "Willard" battery made by Messrs. Sipe & Sigler, of Cleveland, Ohio. The new company will be largely financed and managed by officers of several Edison lighting companies, particularly of the Chicago, Boston and New York Edison companies. Engineers representing the capitalists have been for some weeks scrutinizing the value of the Willard storage system; attorneys have given careful consideration to the patent question, and a number of meetings have been held at the Waldorf-Astoria, in New York, by the contracting parties. The Electrical Review is not informed as to whether other patents may be bought to be merged into those pertaining to the Willard battery, but it is understood that the Edison interests have been attracted by the possibilities of the Willard cell because of the showing which the installation of this battery made at Wilmington, Del. Negotiations have progressed to such a point that the consummation of the plan is said to be assured. The new company is being formed largely with the idea, it is understood, that the Edison companies throughout the country will be likely to adopt the Willard battery in their central stations.

If this company is organized it will mean a formidable rival for the "Chloride" battery, manufactured by the Electric Storage Battery Company, of Philadelphia, and the battery made by the American Battery Company, of Chicago, which has gained considerable reputation.

On Friday, April 7, a representative of the Electrical Review met Mr. Samuel Insull, President of the Chicago Edison Company, on a train en route from New York to Philadelphia. The representative outlined to Mr. Insull the information which has here been given relative to the formation of a large company for manufacturing storage batteries, and asked him as to the accuracy of the information. Mr. Insull, without hesitation, replied: "I can not deny the truthfulness of this information, because it is correct. Negotiations are pending, and your statements are well based."

A gentleman in position to speak without prejudice, stated to the Electrical Review on Monday that he believed this new company was the natural outgrowth of the development of the storage battery; that the largest patrons of the storage battery to-day were the central lighting stations, although the electric railway power-stations were gradually increasing their use of the storage battery. He said it further meant that the large field for storage batteries, which was showing up in the use of electric vehicles, was destined to cause an immense demand, and that he understood that the new company would make a specialty of supplying such batteries for transportation companies in opposition to the Electric Vehicle Company.

In another column is announced a new electric vehicle company in Chicago, with several central station men interested.

All this news is additional evidence that the electric accumulator is destined to prove of vast and increasing importance in electrical development.

Death of M. K. Bowen.

Menard K. Bowen, president of the Chicago City Railway Company, died on April 9, at the Chicago Hospital, from the effects of an operation for appendicitis performed the same day. He was born at Jefferson Barracks, Mo., in 1858. He was a son of Gen. John S. Bowen. When quite a young man he earned a reputation as a street railway manager in Kansas City. From there he went to New York, and a year later went to Chicago as superintendent of the City Railway Company. In January, 1897, he was elected general manager, and in January, 1898, was made president of the road. Mr. Bowen had been prominently identified with the American Street Railway Association, and was well known in traction circles.

The McElroy-Grunow Electric Railway system, of Jersey City, N.J., with a capital stock of $150,000, has been incorporated. The company intends to construct, improve and manage electric railway systems, and the incorporators are William M. Klink, of Jersey City, and G. De Testetico and Peter Whitney, of New York city.

High-Insulation Line Material.

Mr. Fred M. Locke, of Victor, N.Y., is one of the best known manufacturers in the country of high-insulation line material for high-voltage transmission service. He manufactures a complete line of porcelain and glass insulators, break arms, side brackets, ridge irons and steel pins.

The body and glaze of the Locke china insulators are of simple earths only, fused into a vitreous, homogeneous mass at the highest temperature. As no metallic oxide is used in the process, the glaze is not a conductor. The insulators so made do not craze or crackle on the surface or leak when subjected to variations of temperature. They will stand severe tensile strains and heavy blows, and will not, it is claimed, crack or chip from the effects of high-potential currents.

Several examples of the Locke china insulators are shown in the illustrations herewith. Fig. 1 represents a two-part cable insulator for heavy line wires and cables. The two shells, made from the highest grade china, are fused together with glaze. Used with the Locke steel pin, with porcelain base, these insulators afford excellent line construction. This insulator will stand a test of 30,000 volts, is three and one half inches in diameter and weighs about one and one-half pounds.

one is designed to carry 20,000 volts, is five and one-fourth inches in diameter and three and one-fourth inches high and weighs two and three-fourth pounds.

Mr. Locke has just issued a new catalogue illustrating and describing his extensive line of insulation material. The catalogue will be sent free on request.

The Paillard Non-Magnetic Watch.

The rapidly extending use of electrical appliances increases the danger to ordinary watches. The balance

MOVEMENT OF THE PAILLARD NON-MAGNETIC WATCH.

and hair-spring of a watch are influenced, and these susceptible parts become disarranged. Carl A. Paillard, a celebrated adjuster of Geneva, Switzerland, has, after 14 years of scientific experimenting, invented a palladium hair-spring and a compensating balance that entirely overcome the difficulties heretofore encountered. These movements have been put to the severest tests. They can be brought into actual contact with dynamos or electro-magnets, and are not affected in action. They are entirely insensible to heat if placed on a stove. The hair-spring will not rust if placed in salt water. Watches with these movements, therefore, become very convenient to travelers, artisans, professional men, navigators, railroad men and telegraph men, engineers, electricians and all residents of cities.

The Paillard non-magnetic watches are made by A. C. Becken, of Chicago, Ill., in all grades and sizes. Every watch is warranted to give perfect satisfaction. They are claimed to be unsurpassed for durability, workmanship and accuracy. They are made by skilled workmen, the jewels are carefully selected, and cases exceptionally strong and of the highest attainable finish, and each watch is thoroughly tested. No higher price is asked for these watches than for equally finished work without these improvements.

Sale of the Fort Wayne Electric Corporation.

Pursuant to an order of the United States District Court for the district of Indiana, the real estate, plant, property and good-will of the Fort Wayne Electric Corporation will be sold at Fort Wayne, Ind., on April 18, at public auction. The upset bid is to be two-thirds of the appraised valuation of the property. A mortgage of $185,000, held by the General Electric Company, is declared by the court to be a first lien on the property of all sorts.

The Doylestown Trust Company, receiver of the Doylestown, Pa., & Willow Grove Trolley Road, has made application to the court for authority to borrow $12,000 with which to improve the road and add to its equipment.

A Consolidation of Glass Specialty Manufacturers.

Those who are engineering the consolidation—not trust—of the lamp and glass specialty manufacturers, are not averse to publicity, as are their tableware brethren. Unless something unforeseen happens, this enterprise will be floated within a couple of weeks, with ample capital back of it.

The concerns interested are the Phœnix Glass Company, Dithridge & Company, of Pittsburgh, Pa.; Consolidated Lamp and Brass Company, of Coraopolis, Pa.; Pittsburgh Lamp and Brass Company, Pittsburgh, Pa.; Fostoria Glass Company, Moundsville, W. Va., and Eagle Glass Manufacturing Company, of Wellsburg, W. Va.

The new company will be capitalized at $6,000,000—$4,000,000 in preferred and $2,000,000 in common stock. Everything now looks successful in the promotion of this consolidation, and, if completed, it will result greatly to the benefit of all concerned, and of the trade generally.

Rowland's Multiplex Printing Telegraph.

Prof. Henry A. Rowland's multiplex telegraph printer will be introduced to the commercial world by a company having a capital of $2,000,000. The company has been incorporated under the laws of West Virginia, with the following incorporators: Alexander Brown, Frank S. Hambleton, Charles E. Fisher, Leon Baker, Prof. Ira Remsen, of the Johns Hopkins University; Eugene Levering and Gen. John Gill, of Baltimore. The company, it is said, will be ready to start business within a month.

FIG. 1.—TWO-PART CABLE INSULATOR.

FIG. 2.—THREE-PART CHINA INSULATOR.

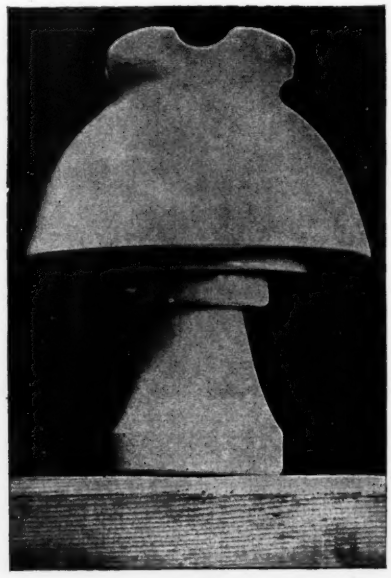

FIG. 3.—THREE-SHELL CHINA INSULATOR.

Fig. 2 shows a three-part insulator, fused with glaze, designed to carry from 20,000 to 35,000 volts, and which, it is said, will stand a salt water test of 80,000 volts. It is compact in form, standard in quality and of large capacity. The insulator is seven inches in diameter, four and one half inches high and weighs three and three-fourth pounds. A similar insulator is shown in Fig. 3. This

Electric Power Distribution in a Corrugated Iron Works.

A very interesting plant has recently been installed in the works of the Cincinnati Corrugating Company, at Piqua, Ohio. The shops occupy an area of about 200,000 square feet, and the various machines employed were formerly driven by six independent steam engines. In the new plant, power is generated by two 40-kilowatt, 220-volt generators, driven by a 120-horse power Corliss engine. The generators are belted to a countershaft from which three belts are taken, one from each generator and one for supplying power to machinery close to the station. Friction clutches are used on each of the generator-driving pulleys, so that they may be worked independently or together as the load may require. The switchboard is of marble with all back connections, and is finished in nickel and japan.

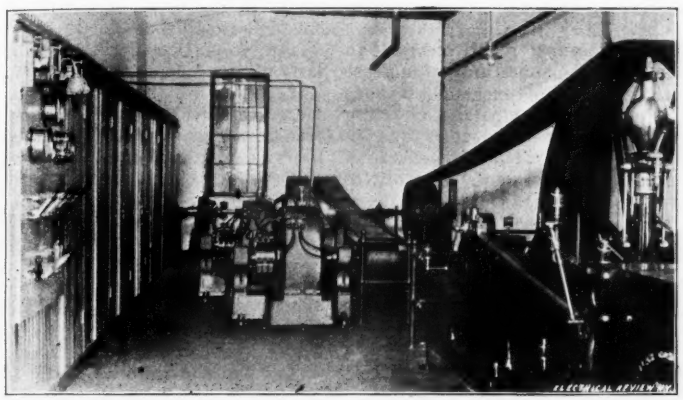

FIG. 1.—CINCINNATI CORRUGATING COMPANY'S CENTRAL ELECTRIC POWER PLANT.

From this station the feeders are distributed over the works supplying power to a number of motors, 24 long-burning arc lamps and over 100 incandescents.

The motors are distributed as follows: One 25-horse-power multipolar in the scrap shed for driving large shears and to furnish power for the blacksmith and machine shops. The shears driven by this motor will cut cold wrought iron 12 inches wide and one and three-fourth inches thick.

One 18-horse-power multipolar is installed in the rolling mill and drives a large blower and stokers for five puddling furnaces.

In addition to these multipolar motors there are four seven-and-one-half-horse-power bipolar motors, one for driving the roll turner's lathe, one for the heating-furnace blower, one for a gang of shears and one for the dipping handling machinery in the galvanizing department. In the installation of these smaller motors, in order to simplify the wiring, economize space and better care for the motors, the rheostats were mounted directly on top of the machine.

This plant has been now operating for over two months, running 24 hours per day for six days in the week Most of the machinery is in exposed places, as the mill is open for the most part on all sides, yet, in spite of the constant and heavy duty imposed on the electric machinery, no time has been lost on account of any trouble arising from the electric installation. The saving in steam consumption has been decidedly marked. Although the motor load fluctuates a great deal at times, still the effect of this is unnoticeable on either the arc or incandescent lights.

The plant was installed by the Hobart Electric Manufacturing Company, of Troy, Ohio.

All the machines installed here are of its regular type, having steel magnetic circuits, tempered-copper commutators, self-oiling bearings, etc. The plant is of interest as showing the successful operation of electric motors for rough-and-ready work, and the economy of electric power distribution as compared with independent engines.

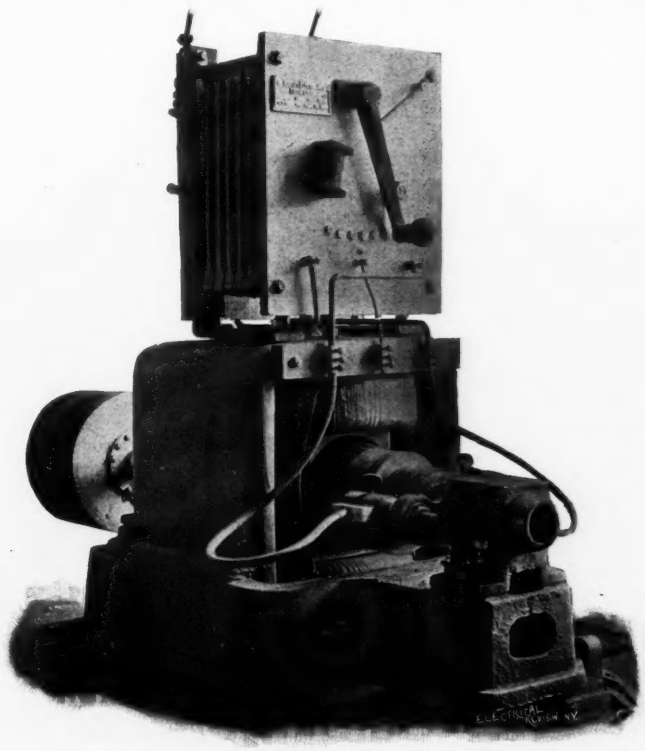

FIG. 2.—RHEOSTAT MOUNTED ON TOP OF HOBART MOTOR.

Preserving Rubber Trees in Congo.

The government of the Congo Free State, with the object of preventing the threatened destruction of the india-rubber trees in that country, has promulgated a decree by which it is provided that for every ton of rubber yielded annually there shall be planted not less than 150 trees. A bureau of control of rubber forests is created and is charged with the enforcement of the decree which prohibits gathering rubber in any other mode than through incisions in the bark. Infractions of the new decree are punishable by fine up to $2,000 or imprisonment. Employers and directors of corporations are held personally responsible for the acts of their subordinates. Guide books for the cultivation of rubber are furnished by the district commissioners on request, and agricultural inspectors will be placed temporarily at the service of private owners.

ELECTRIC RAILWAY NOTES.

The Dallas, Tex., Consolidated Electric Street Railway property has been sold to a syndicate from Des Moines, Iowa, for $900,000.

It is reported that Frank S. Hambleton, of Baltimore, Md., is in Nashville, Tenn., consummating a deal for the Nashville Street Railway. The Hambleton Baltimore syndicate owns the street railway and electric light and power plant at Knoxville, Tenn.

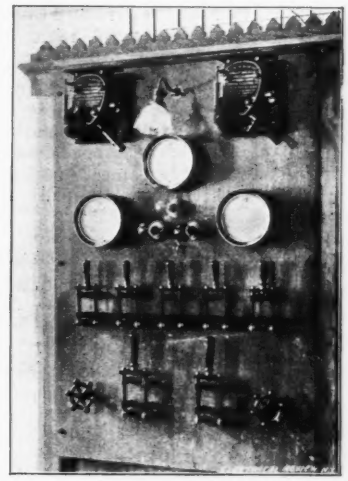

FIG. 3.—CINCINNATI CORRUGATING COMPANY'S SWITCHBOARD.

The directors of the Needham & Boston, Mass., Street Railway Company have practically completed their plans for the construction of the new line between Needham and Spring street, West Roxbury. The contract has been awarded to Mr. Lucey, of Natick.

The National Traction Company has been incorporated with $10,000 capital stock. The object is to build and operate an electric railway along or near the national road from Columbus to the west state line of Ohio, through the counties of Franklin, Madison, Clark, Miami, Montgomery and Preble, and to carry passengers, freight and express. The principal office is to be at Phoneton, Miami County.

A report comes from Lawrence, Mass., that the Lowell, Lawrence & Haverhill Street Railway has been purchased by a New York syndicate, headed by J. Pierpont Morgan, and that the portion of the stock bought was held by the Industrial Improvement Company, which held a majority; that the deal, which was effected through Boston firms, involves the transfer of the greater part of $3,000,000 worth of stocks and bonds; that the Brockton Street Railway and another in the eastern part of the state pass to the same purchasers.

American Bell Telephone Company's Annual Report.

The nineteenth annual report of the directors of the American Bell Telephone Company to the stockholders, covering the year ended December 31, 1898, is as follows:

OFFICE OF THE AMERICAN BELL TELEPHONE CO., BOSTON, March 28, 1899.

TO THE STOCKHOLDERS:

The usual tables showing the output of telephones from 1884 to the beginning of the current year and the various statistics, in a consolidated form, of the companies operating under license from this company, are subjoined:

The underground system has been greatly extended in recent years. While we formerly reported the specific cities in which work of this character had been done, its use has now become so general that its absence in any place of commercial importance is the exception. Three hundred and fifty-eight thousand miles, or nearly half, of the exchange wire in the country is now operated under ground.

The Long-Distance company had on January 1, 1899, 10,079.05 miles of pole line and cable, and 123,275.05 miles of wire connecting 285 offices; a gain during the year of 1,301.05 miles of pole line and cables, 7,159.05 miles of wire and 47 offices.

construction and equipment, and $4,658,425.73 upon toll lines. In addition to the above, $1,107,285.55 was invested in real estate, to be used for company and exchange purposes.

The entire expenditure for construction, including real estate, to the close of 1898 has been $111,159,-309.26.

Our last annual report recorded an output of telephones and an increase in the number of exchange stations reported by the companies operating under our licenses greater than in any previous year, but the year which has just closed presents a record of even greater growth.

More than 80,000 subscribers have been added, requiring 146,000 miles

INSTRUMENTS IN THE HANDS OF LICENSEES, UNDER RENTAL.

(The figures in lower line showing increase from year to year.)

Dec. 20, 1884.	Dec. 20, 1885.	Dec. 20, 1886.	Dec. 20, 1887.	Dec. 20, 1888.	Dec. 20, 1889.	Dec. 20, 1890.	Dec. 20, 1891.	Dec. 20, 1892.	Dec. 20, 1893.	Dec. 20, 1894.	Dec. 20, 1895.	Dec. 20, 1896.	Dec. 20, 1897.	Dec. 20, 1898.
325,574	330,040	353,518	380,277	411,511	444,861	483,790	512,407	552,720	566,491	582,506	674,976	772,627	919,121	1,124,846
	4,466	23,478	26,759	31,234	33,350	38 929	28,617	40,313	13,771	16,015	92,470	97,651	146,494	205,725

EXCHANGE CONNECTIONS.

The estimated number of exchange connections daily in the United States, made up from actual count in most of the exchanges, is 3,823,070.

Or a total per year of about 1,231,000,000.

The number of daily calls per station varies in different exchanges from $1\frac{3}{10}$ to $18\frac{7}{10}$, the average throughout the United States being $8\frac{2}{10}$.

The average cost to the subscriber by exchanges varies, according to the size of the exchange and character of the service, from less than 1 to $9\frac{4}{10}$ cents per connection.

COMPARATIVE STATEMENT.

	Number of Companies.	Number of Stations.	Connected by Metallic Circuit.		Cabinet Sets.
			Number.	Per Cent.	
Jan. 1, 1898...	35	325,250	146,394	45.01	22,928
Jan. 1, 1899...	38	409,520	200,528	48.96	25,158
Increase....	3	84,270	54,134	3.95	2,230

In all there are 38 companies whose systems furnish our long line terminals. These companies report a

of new exchange conductors, and the toll-line system has been increased by some 61,000 miles of wire.

The number of exchange conversations for the year, computed from daily averages reported, has reached 1,231,000,000.

This great development, while in part due to the increased business activity which has prevailed throughout the country, is, at the same time, largely the result of efforts on the part of the operating companies to bring the telephone within reach of more numerous classes of the community, by offering the lower rates

EXCHANGES.

	Jan. 1, 1884.	Jan. 1, 1885.	Jan. 1, 1886.	Jan. 1, 1887.	Jan. 1, 1888.	Jan. 1, 1889.	Jan. 1, 1890.	Jan. 1, 1891.	Jan. 1, 1892.	Jan. 1, 1893.	Jan. 1, 1894.	Jan. 1, 1895.	Jan. 1, 1896.	Jan. 1, 1897.	Jan. 1, 1898.	Jan. 1, 1899.	Increase.
Exchanges.....	906	772	747	736	739	742	757	774	788	812	838	867	927	967	1,025	1,126	101
Branch Offices..	419	481	428	446	452	452	471	467	509	539	571	572	686	832	937	1,008	71
Miles of wire on poles.....	.....	88,481	100,332	111,349	127,839	142,631	154,009	171,498	180,139	201,259	214,676	232,008	260,324	286,632	327,315	396,503	69,188
Miles of wire on buildings.....	.....	11,886	10,043	10,587	10,225	10,266	11,484	13,445	14,954	14,980	16,492	14,525	12,861	12,594	13,776	15,329	1,553
Miles of wire under ground.....	.....	1,225	3,417	6,030	8,009	17,038	27,117	54,690	70,334	90,216	120,675	148,285	184,515	234,801	282,634	358,184	75,550
Miles of wire submarine.....	.....	.....	254	265	365	536	603	779	1,029	1,336	1,637	1,856	2,028	2,818	2,675	2,973	298
Total miles of wire.....	85,896	101,592	114,046	128,231	146,438	170,471	193,213	240,412	266,456	307,791	353,480	396,674	459,728	536,845	626,400	772,989	146,589
Total circuits....	97,422	107,440	112,067	121,260	132,004	143,687	156,780	173,665	186,462	201,322	205,891	212,074	237,837	264,645	295 904	338,293	42,389
Total employés..	4,762	5.168	5.438	5.843	6,183	6,310	6,758	7,845	8,376	9,970	10,421	11,094	11,930	14,425	16,682	19,668	2,986
Total stations....	123 625	134,847	137,750	147,068	158,712	171,454	185,003	202,931	216,017	232,140	237,186	243,432	281,695	325,244	384,230	465,180	80,950

EXTRA-TERRITORIAL AND TOLL LINES.

	Jan. 1, 1884.	Jan. 1, 1885.	Jan. 1, 1886.	Jan. 1, 1887.	Jan. 1, 1888.	Jan. 1, 1889.	Jan. 1, 1890.	Jan. 1, 1891.	Jan. 1, 1892.	Jan. 1, 1893.	Jan. 1, 1894.	Jan. 1, 1895.	Jan. 1, 1896.	Jan. 1, 1897.	Jan 1, 1898.	Jan. 1, 1899.	Increase.
Miles of Pole Lines.	20.592	25,766	30,697	31,148	32,478	34,010	35 254	35,541	41,298	42,894	46,727	49,324	52,873	60,453	67,791	75,718	7,927
Miles of Wire.....	29 359	35,611	41,745	43,767	56,179	73,293	86,728	91,230	115,088	133,002	154,106	180,557	215,687	268,866	324,883	385 911	61,028

TOLL CONNECTIONS.

The average daily number of toll connections is 95,147.

Or a total per year of about 30,600,000.

The toll revenue reported by all companies for the year 1898 was $5,571,710.11.*

*Not including herein earnings of the American Telephone and Telegraph Company.

total of 409,250 stations, of which 200,528 (48.96 per cent) are equipped with metallic circuits; and of these 200,528 stations, 25,158 are equipped with long-distance cabinet sets.

The new construction completed in 1898 by companies with which we have contract relations amounted to $12,105,921.44. Of this sum $7,447,-495.71 was expended upon exchange

for which party-line and measured service can be furnished.

The rapid extension of both these classes of service is the most noticeable feature of the business of recent years. By the improved adjustment of apparatus upon the party-line circuits, service over these lines is excellent, and the great advantage is gained that the cost of maintaining an expensive circuit and the interest charge upon investment are divided between two or more stations instead of being chargeable to one. While it is true that many subscribers require the exclusive use of a circuit, or even of more than one circuit during the business hours of the day, it is equally true that one-third or one-fourth of the time is sufficient for the needs of a large proportion of those who regularly use the telephone.

To an increasing extent, also, the measured service plan has come to be recognized by a numerous class of users as equitable and well suited to their wants. The measured service subscriber pays nothing for the calls received at his station, and contracts only for such number of outward calls as will serve his needs. So acceptable has this system proved that, out of the 465,000 subscribers in the United States, 90,143 are now connected under measured service contracts.

The figures exhibited in the tables which precede show how important a factor the telephone has become in the business, professional and home life of the people of this country. Its use is by no means restricted to large business houses whose affairs are conducted upon an extended scale. With the higher development of the exchange system, it has come about that, of the great body of nearly half a million subscribers, the larger proportion are the people of moderate means, engaged in trade, mechanical and professional work, to whom the service is a profitable agent for the despatch of business and the saving of expense, or are householders who find it a convenience and protection to the home.

It is due also to those having direction of the companies operating under our licenses, to say that their effort has been to meet the public requirement by keeping the service, as a whole, at a high standard of efficiency. It is a fact worthy of note that 251,000 exchange subscribers are now connected by metallic circuits, suitably equipped for long-distance service.

The statistics of European countries at the close of 1897, taken from such reports and publications as can be obtained, showed the number of exchange stations in the German Empire to be 173,981; in Sweden, 56,-500; in Austria and Hungary, 33,862; in Switzerland, 32,252; in Norway, 20,678; in Russia, 20,108; in France, estimated, 45,000; in all of Continental Europe together, 453,844; in Great Britain and Ireland, at the end of 1898, 103,084. At that time the American Bell Telephone system in the United States numbered 465,180 exchange stations. Toll line conversations in this country are held over distances of about 2,000 miles; the longest telephone line in Europe being 850 miles.

The ledger balances as they stood upon the ledgers December 31, 1898, and a comparative statement, in detail, of the earnings and expenses of the company for the years 1897 and 1898, are furnished by the treasurer and are appended.

The Long-Distance company has

invested, up to December 31, 1898, in line construction, franchises, equipment and supplies, $14,847,587.29. The company shows an increase in gross earnings in 1898 over 1897 of $17\frac{36}{100}$ per cent, the amount for 1898, gross, being $2,205,706.01.

Copies of the reports of the committee on treasurer's accounts of April 27, July 18 and December 20, 1898, and of March 7, 1899, are subjoined.

For the directors,
JOHN E. HUDSON, President.

LEDGER BALANCES, DEC. 31, 1898.

DEBTORS.

Telephones	$2,248,532 96
Real estate	1,052,695 92
Stocks and bonds	58,776,425 59
Merchandise and machinery	18,270 82
Bills and accounts receivable	2,086,092 00
Cash and deposits	676,987 30
	$64,859,004 59

CREDITORS.

Capital stock	$25,886,300 00
Capital stock premium	6,110,582 00
Debenture bonds, 1888	49,000 00
Debenture bonds, 1908	5,000,000 00
Bills and accounts payable*	1,277,827 50
Patent account (profit and loss)	12,399,147 16
Profit and loss	6,851,515 19
Reserve	4,499,558 90
Surplus	2,785,073 84
	$64,859,004 59

*Of this amount, $1,164,883.50 is for the dividends payable January 16, 1899, to stockholders of record December 31, 1898.

COMPARATIVE STATEMENT OF EARNINGS AND EXPENSES.

EARNINGS.

	1897.	1898.
Rental of instruments	$1,597,959 36	$1,610,855 64
Dividends	3,085,379 00	3,239,406 58
Commission from extra territorial lines	211,507 21	121,511 07
Commission from telegraph business	33,174 32	18,389 20
Real estate	84,709 85	83,864 92
Interest	117,071 93	370,991 58
Miscellaneous	1,043 25	3,682 50
	$5,130,844 92	$5,448,701 49

EXPENSES.

Expenses of operation	$509,314 02	$509,673 90
Legal expense	136,333 49	94,226 62
Real estate	41,560 76	40,235 09
Interest and taxes	273,961 92	408,851 65
Miscellaneous		1,747 42
	$961,170 19	$1,054,734 68
Net earnings	$4,169,674 73	$4,393,966 81
Surplus account, December 31, 1897	$2,590,521 27	
Net earnings, 1898	4,393,966 81	
		$6,984,488 08
Regular dividends, 1898	$3,106,356 00	
Extra dividends, 1898	776,589 00	
Reserve for depreciation of instruments	316,469 24	
		4,199,414 24
Surplus account, December 31, 1898		$2,785,073 84

TREASURER'S STATEMENT.

The following is the treasurer's statement of the American Bell Telephone Company, as of December 31, 1898:

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WILLIAM R. DRIVER,
Boston, March 28, 1899. Treasurer.

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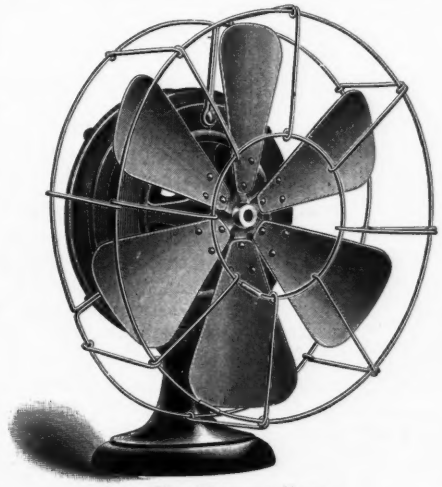
A New Battery Fan.

Electric fans to operate on battery circuits are a grateful addition to the equipment for Summer comfort, especially in places where an incandescent circuit is not available. Well built battery fans in two sizes, eight and 10-inch, are now being put upon the market by the J. Jones & Son Company, New York. They are adapted to operate with the usual forms of primary batteries now in use for similar purposes. The motors contain a starting switch in the base,



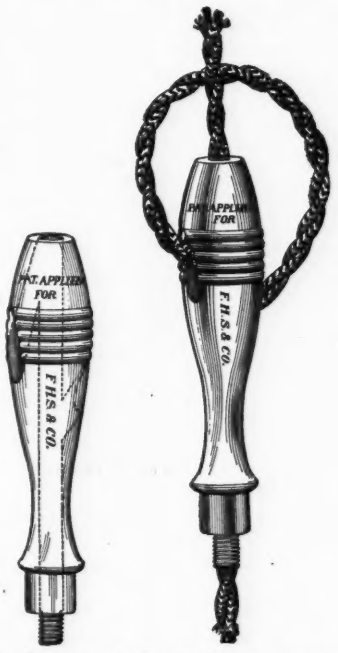
A NEW BATTERY FAN.

and are sent with or without a battery outfit.

Experiments in wireless telegraphy are going on well in Germany. They threaten to make Spain more formidable in future wars. With such a system working well half-way around the globe, no cable cutting could prevent Spanish generals from beating their enemies as often as they liked, on paper.—*Cleveland, Ohio, Leader.*

Combination Socket Handle and Adjuster.

The convenient and simple combination of socket handle and adjuster shown in the accompanying illustrations is designed to obviate a number of troubles inherent in the unsightly wooden ball device, and at the same



COMBINATION SOCKET HANDLE AND ADJUSTER.

time to relieve the mechanism of the socket of all strain. The ferrule, forming the lower part of the handle, is of metal, making a firm and solid joint with the socket. The cord is threaded through the handle, as the illustrations show, in such a way that, while adjustment is easy and instantaneous, any size of cord is tightly gripped. The advantage of a handle is considerable, and the combination is one that must prove very useful and handy. It is manufactured by Frank H. Stewart & Company, 35 North Seventh street, Philadelphia.

Railway Material Wanted.

The Anacostia & Potomac River Railway Company has appointed a construction committee consisting of F. C. Stevens, 1417 G street, Washington, D. C.; T. J. Hayward and C. A. Lieb, 20 Broad street, New York. The company is now in the market, and will place immediate contracts for the equipment of 15 miles of railway with the conduit electric system, and will buy 85 cars with trucks, rotary converters and full power-station equipment.

New Orleans-Galveston Telephone Line.

A movement is on foot for the construction of a long-distance telephone line from New Orleans, westward, to Texas points. Mr. Charles J. Glidden, the president of the Southwestern Telegraph and Telephone Company, which operates under a Bell license, in the states of Arkansas and Texas, has been in New Orleans in conference with other telephone men, and there is strong probability that the line will be built at once.

Mr. Glidden is considered one of the strongest telephone men in the whole country. Besides being at the head of the Texas and Arkansas service, he is the president of the Michigan Telephone Company, of Detroit; the Northwestern Telephone Exchange Company, of Minnesota, North Dakota, South Dakota, and president of the Cleveland Telephone Company, of Cleveland, Ohio.

These combined companies serve 60,000 subscribers, covering seven states, and include 125,000 miles of wire. Taken as a whole, the combined interests represent the largest system in the United States working the Bell patents.

Thomas A. Edison Objects to the Use of His Name.

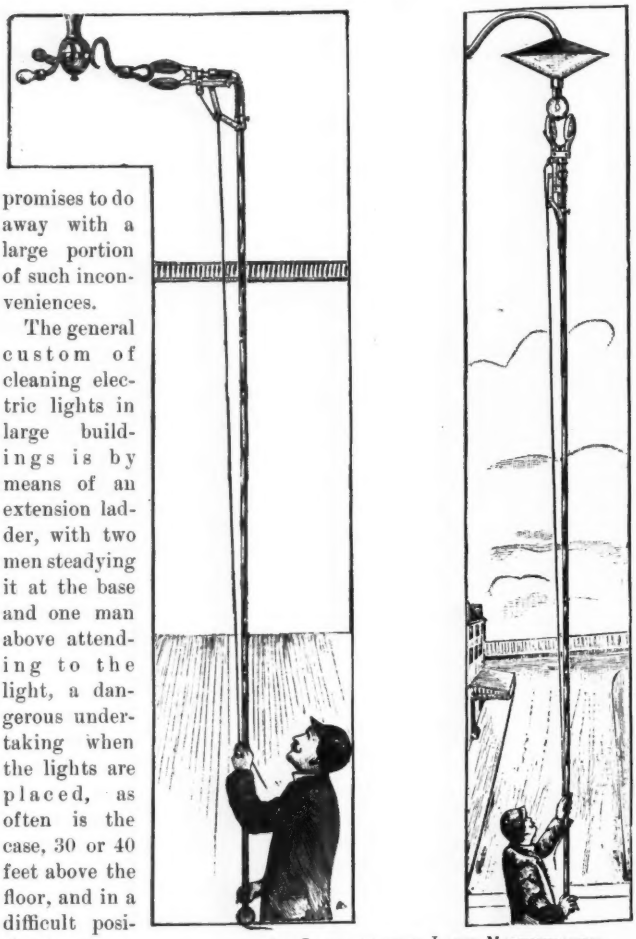
Proceedings will be begun this week in the United States Circuit Court in Newark, N. J., in behalf of Thomas A. Edison, asking for a permanent injunction to restrain a number of persons from using Mr. Edison's name without authority. According to a bill in equity filed in the court, Mr. Edison has suffered through the unauthorized use of his name by dealers in sound-producing machines which are not of his invention, but which in some cases are alleged to be. The first defendant against whom proceedings will be brought is James A. Griffith, of Philadelphia, who conducts a store in that city under the name of "The Edison Phonograph Company."

A New Chicago Electric Vehicle Company.

The Chicago Electrical Vehicle Company has been incorporated with a capitalization of $2,000,000, and will soon begin the manufacture and operation of a line of electric vehicles for avenue and road purposes. Among the incorporators are Edward Brewster, Samuel Insull and William G. Beale. It is said Robert T. Lincoln is also interested in the new company.

An Incandescent Lamp Manipulator.

One of the greatest difficulties experienced in the use of incandescent electric lights situated at any height in public buildings, railroad stations, art galleries, etc., is the ability to properly clean and renew them from time to time. The Incandescent Electric Light Manipulator Company, of 116 Bedford street, Boston, Mass., has recently perfected and placed on the market an instrument which promises to do away with a large portion of such inconveniences.



AN INCANDESCENT LAMP MANIPULATOR.

The general custom of cleaning electric lights in large buildings is by means of an extension ladder, with two men steadying it at the base and one man above attending to the light, a dangerous undertaking when the lights are placed, as often is the case, 30 or 40 feet above the floor, and in a difficult position to get at. With the new manipulator, one man can attend to the renewing and cleaning from the floor, avoiding the necessity of any climbing.

Two nippers, lined with rubber, are attached to the end of the manipulator pole, and are made to fit any standard make of incandescent lamp. A small wheel placed at the other end operates the nippers—opening and closing them.

When desired to renew a burned-out or broken bulb, the nippers are firmly set around it and the pole turned in the proper direction, and, by means of an inside spring, the light is unscrewed from the socket.

When the light is situated at an angle or in an alcove, a cord attached to a sliding toggle-pin forms the connection at the base for bending the supple head of the manipulator to the required degree, and an automatic finger slide or pawl retains the grip on the bulb while the operator is turning the pole.

In cleaning a light two felt mittens are placed over the nippers, which are lightly placed around the bulb and turned in a direction opposite to the thread of the lamp.

The pole itself is arranged after the manner of a telescope, the ends fitting into one another so that it can be adjusted to the required length.

The manipulators are made in any desired size or length, and can be successfully operated, by one accustomed to its use, to the height of 40, or even 60, feet. The accompanying illustrations show the manipulator being operated with the light placed perpendicularly and at an angle.

Telegraphers' Congress at Como, Italy.

The town of Como, Italy, is preparing to celebrate the centennial of the discovery of the electric battery, Alessandro Volta, the famous scientist having been born there. In connection with the exposition there will be held an international congress of telegraphers, beginning May 31, 1899, and lasting four days. All the prominent telegraph and cable companies will be represented.

Western Business News.

The City Council has granted a franchise to the Pendleton, Ind., Waterworks and Electric Light Company to put in a waterworks and electric light system. The combined plant will cost $34,000.

The Eddy Electric Manufacturing Company, of Windsor, Ct., have opened up the Chicago offices of the company at 837 and 838 Marquette Building, for the sale of Eddy generators and motors. The reputation of this company is well established, and an especially large business is contemplated from this section. Mr. J. M. Denniston, well known in the electrical field, has been appointed salesman from the Chicago office, and his friends wish him success in his new venture.

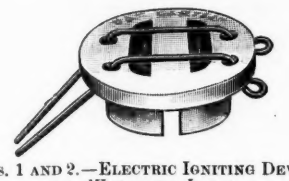
The Hart & Hegeman Manufacturing Company, of Hartford, Ct., manufacturers of Hart switches, report through their western representative, Geo. S. Searing, 1440 Monadnock Building, Chicago, larger sales of Hart switches than ever before. The Hart & Hegeman push switch is especially in demand and there is every indication of a very heavy Spring trade. The Hart switch is known everywhere to be a first-class article in every respect.

The Stromberg-Carlson Telephone Manufacturing Company, of Chicago, manufacturers of telephone apparatus, toll line equipment, central energy system, police and fire signaling service, etc., will shortly enlarge their present quarters to twice the space they now occupy. The company will put in a considerable amount of new machinery, which will enable them to handle a much larger business and hurry the orders already on hand. They are now installing a 5,000-line central energy exchange for St. Paul and Minneapolis, besides a number of smaller exchanges throughout the country.

The Royal Electric Company, of Peoria, Ill., announce that they have appointed J. B. Wallace their Chicago agent, with offices at 1201-2 Marquette Building. Mr. Wallace will look after the sales of Royal apparatus in Michigan, Ohio, Indiana, Wisconsin, Minnesota, eastern Iowa and northern Illinois. The factory is located at Peoria, Ill., and manufactures a most complete line of transformers, generators and other machines for alternating current. Their products have become well known in the electrical field, and, under Mr. G. G. Luthy's management, the company have established a first-class reputation.

New Device for Igniting Welsbach Lights in Series.

The reduction in price of Welsbach lights has greatly increased the demand for them by those limited to gas as an illuminating agent, on account of the greater economy in consumption over the old style of burners and the vastly increased candle-power per foot of gas. In lighting a number of these lamps in series, by coil or frictional machine, the peculiar enclosed form of the light, the chimney and delicate mantle, presented conditions of considerable embarrassment regarding the attachment of the spark electrodes, as not only had ample insulation to be provided in a narrow and contracted space in the lamp parts, but, at the same time, the mantle must not be endangered.



FIGS. 1 AND 2.—ELECTRIC IGNITING DEVICE FOR WELSBACH LAMPS.

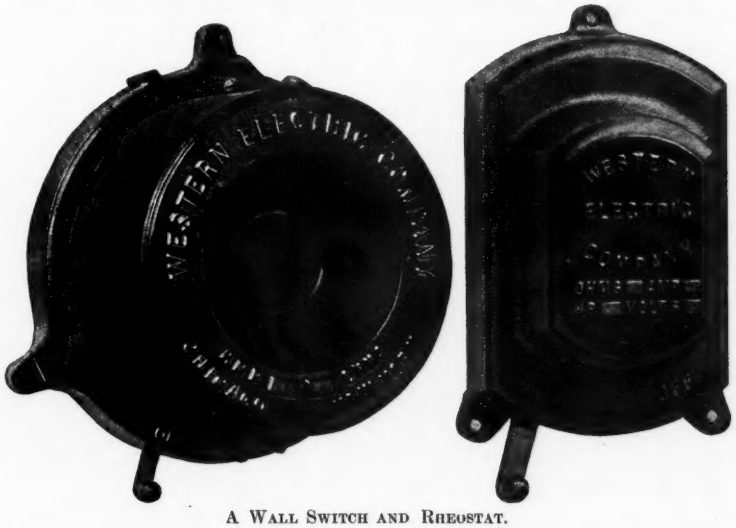
The A. L. Bogart Company, of 123 Liberty street, New York city, which has for a long time made a specialty of electric igniting attachments for this class of lamps, has lately put on the market the simple and convenient device for series spark lighting illustrated in Fig. 1, which is particularly adapted for use with Welsbachs with mica chimneys. The two electrodes are rigidly attached to a porcelain holder, provided with a slot in its base, which embraces the top of the mica chimney, as shown in Fig. 1. Fig. 2 shows the electrode holder or clip on an enlarged scale. A porcelain pillar is also supplied, which insulates the metal work of the entire lamp. With this device no alteration or cutting of the lamp is necessary. The electrode spark-points are below the level of the top on the chimney, so that drafts of air can not divert the stream of gas from the spark.

Fire in a Telephone Manufactory.

The Telephone Manufacturing Company, of Sumter, S. C., whose woodworking shop was recently damaged by fire, has secured temporary quarters for that department of its business and is now prepared to make shipments as usual.

Special Wall Switch Rheostats.

The wall-pattern switch rheostats, illustrated in the accompanying engravings, are designed for use with ceiling fans or desk motors, having but one normal speed, or for groups of such instruments running in series on 220 or 550-volt circuits. By their use three speeds can be given to the connected apparatus. The switch rheostat can be placed in any convenient location, either near to or remote from the motor. For controlling the speed of fans, etc., in store, restaurants or other places, where it is not desirable for attendants to interfere with the motors while in operation, or when these are so situated that access to them is difficult, the device is



A WALL SWITCH AND RHEOSTAT.

one of great convenience. It is made by the Western Electric Company, in seven sizes, for use with different voltages and combinations of motors.

Electric Railways in Breslau.

The city of Breslau, Germany, is about to grant a charter to the street railroad company for a term of 24 years, with privilege of putting the same under electric motive power in place of horse-power, which is used at present. The reconstruction of the road must be completed within two years after the contract has been approved.

Overhead and underground systems are to be used. The company agrees to take from the city what electric motive and lighting power it may use for the cars. The city binds itself to furnish sufficient power for said purpose, but it is not liable for any damages in case of a breakdown at the power-house. The fare is to be 10 pfennigs (2.38 cents), with transfer over any of the lines. The city is to receive from the company for the privilege and the use of the streets —after the expenses for power, employés, keeping tracks, cars and wire in repair are deducted—33⅓ per cent of the receipts. After December 31, 1907, the city and company will share equally in the net profits. At the expiration of this contract, the city has the right to take charge of the property of the company.

Electric Railways in Germany.

Mr. E. L. Harris, United States consular agent at Eibenstock, writes as follows: "I wish to inform our manufacturers of electric appliances that the following cities are planning the immediate construction of electric plants and electric street railroads: Pforzheim, Trier, Ratisbon, Colmar, Jena, Kaiserslautern and Worms. The populations run from 15,000 to 50,000 each. There are still a number of cities of this size in Germany which have no street railways of any kind. Here are not only opportunities for American manufacturers of electrical appliances, but for our capitalists as well. Why not secure a concession and take the initiative? A number of towns in Saxony—mere villages a few years ago—have grown through the rapid development of industries into important centers. In many cases, a single long, narrow street runs through the middle of them. If our manufacturers in this line have no representatives in Germany, it is high time that they should send them."

Space Telegraphy at Washington.

The United States War Department is experimenting with Hertz-wave telegraphy between the department building, in Washington, and Fort Myer, five miles distant. There will be, of course, no difficulty in working over this short distance.

Telephone News .....and Comment

The Bell company has purchased the Clarksburg & Chillicothe, Ohio, Telephone Company.

The Johnstown, Pa., Telephone Company has decided to increase its capital stock from $15,000 to $100,000.

The Citizens' Telephone and Message Company, Tiffin, Ohio, has increased its capital stock from $15,000 to $25,000.

Over 20,000 miles of wire will be strung during the Spring and Summer in the territory of the Erie system in the Northwest.

The result of the canvass for telephone subscribers by the Erie telephone system indicates a net gain for March of 2,500 subscribers.

The stockholders of the Southern Bell Telephone and Telegraph Company held a special meeting last week, to increase the capital stock from $1,000,000 to $2,000,000.

The Mexico, Mo, Telephone Company will shortly establish direct communication with every post office in the county. Work will begin in a few days on the line running to Santa Fe, in Monroe County.

J. B. McBride has filed suit in the Superior Court asking $25,000 damages from the Sunset Telephone Company for the nondelivery of a message to him in Jerome, Ariz., announcing that his daughter was dying and in need of funds.

General Greely has received cable dispatches from Cuba announcing that the military telegraph lines have been completed between Sancti Spiritus and Ciego d'Avila, in the center of the island, and between Holguin and Victoria de Las Tunas, in the department of Santiago.

John W. Mackay the other day gave every woman employé of the Postal Telegraph Company in San Francisco two seats at the opera to hear "Romeo and Juliet." Each one was presented with a large bouquet of her favorite flowers. His generosity cost Mr. Mackay more than $1,000.

The directors of the New England Telephone and Telegraph Company have declared a dividend of $1.50 per share, payable May 15, to stockholders on record at the close of business on March 31. The company has sold $500,000 five per cent debenture bonds, dated April 1, 1899, and payable April 1, 1919.

The Farr Telephone and Construction Supply Company, wholesale dealers in telephone supplies at 357 Dearborn street, Chicago, owing to the growing demands of their business, have leased another floor in the building now occupied by them. The offices will be moved to the new rooms and the entire lower floor will be used exclusively as a sales department and shipping-room.

The Porto Rico Company, with a capital of $1,000,000, has been organized for the purpose of operating properties in Porto Rico. The company consists of prominent Philadelphia and Pittsburgh capitalists. The street railway, electric light plant and telephone system in Mayaguez will shortly be operated by this company, as will also an electric light plant at San German.

The Western Telephone Construction Company, of Chicago, at their annual meeting recently, reelected the following officers: J. E. Keelyn, president and general manager; D. A. Holmes, vice-president; B. F. Stewart, secretary; H. C. Dodge, general superintendent. The following board of directors were also reelected: J. E. Keelyn, W. E. Shirra, D. A. Holmes, M. L. Keelyn, B. G. Stewart.

The Plattsmouth, Neb., Telephone Company has just received 1,000 feet of new cable and two new switchboards, which, with the one now in use, will accommodate 400 subscribers. Within a few weeks the company will commence extending the line until each town in the county has been reached. Many farmers, it is said, along the line, and within a few miles of it, have made arrangements to have telephones placed in their residences.

A syndicate, headed by G. R. Webb and H. A. Parr, of Baltimore, Md., has purchased the Pittsburgh & Allegheny Telephone Company, of Pittsburgh, and will extend the service. Stocks and bonds amounting to $2,500,000 will be issued to cover the cost of the plant and the contemplated improvements. The new company intends to connect with a number of independent companies now operating in smaller cities and towns of Western Pennsylvania and Eastern Ohio.

ELECTRIC STREET LIGHTING.

ABSTRACT OF A PAPER READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION, MARCH 10, 1899, BY ALBERT SHEIBLE.

Street lighting, as a whole, had become quite common for large cities before the advent of electric-lighting practice; indeed, Pompeii had its street lamps, and even the use of gas for street lights dates back almost to the time when Davy discovered the electric arc. Paris was lighted with gas as early as 1817, while Berlin and Dresden followed nine and 10 years later, so that the extended street lighting of large cities from a central point had passed the experimental period more than half a century before the days of electric lighting. What is more, our larger cities 20 years ago seemed to be well aware of the two prime objects of street lighting; namely, path finding and crime preventing.

But it was the arc lamp that came first here and the Jablochkoff candle in Europe. Both of these were lamps of high candle-power, and in admiring their great brilliancy most people forgot the formerly well known objects of street lighting. Wherever the arc lamp or the Jablochkoff candle was shown, the high candle-power made the old gas or naphtha lamps seem very dim and ineffective; hence the cry went up immediately for electric street lamps, powerful street lamps, dazzling street lamps. Mr. Brush himself likes to tell of the first electric street lighting in this country, when a dozen tower lamps were placed on the public square at Cleveland, and when many in the crowds that gathered brought dark spectacles with them! It was not so much the illumination that they were watching for, but rather the dazzle, the glare; and having once seen these dazzling lights and noted the intense illumination near them, the people were not satisfied with anything less brilliant, so that high candle-power of lighting units became a requisite of lamps for street lighting.

As for the lamps themselves, electric street lighting has, for the most part, been done with just the same types of arc lamps that have been used indoors, the works of the arc lamp being somewhat protected from the weather by means of a sheet-iron hood over it. Only within the last half-dozen years have there been lamps with a proper weatherproof casing so as not to need this hood. The so-called 2,000-candle-power (460-watt) and 1,200 candle-power (300-watt) arc lamps are used almost entirely, though here and there we find some smaller sizes, which I believe will be used more largely in the future. The term "2,000 candle-power" in itself impressed the people in the towns lighted as something worth having, and if they happened to find out that the lamps really gave only about a quarter of this candle-power, the electric light men had no difficulty in convincing them that "the 2,000-candle-power lamp is one which sends 500 candle-power in each of four directions from its place over the street crossing." Incandescent lamps have been most commonly used in the 25, 30 and 32-candle-power sizes, with a few of 50 or 75 candle-power, and some of only 16 or 20 candles. However, the distribution of the light from these lamps has almost always been aided by the reflectors over them, which is not the case with the arc lamps.

As a distribution system, the series circuit still holds almost a monopoly for street lighting. It lends itself so readily to the connecting of lamps scattered over a large territory that it was used with the Brush arc lamps just as soon as the differential winding made the operation of arcs in series a possibility. The number of lamps on a circuit and consequent voltage was limited only by the ability of the dynamo builders to properly insulate the parts of their machine. Eighteen years ago a circuit of 16 or 18 arcs was a high voltage circuit, although the lamps then used were the so-called short arcs requiring only 25 to 30 volts each. Bare copper wire was used at that time, but sad experiences with it led to the "underwriters" and later to the so-called "weatherproof" wire, which is still used almost exclusively except for wires leading into the casing of weatherproof arc lamps, for which purpose rubber-covered wires are now preferred.

The size of the dynamos was at first larger in Europe than in America, as the 48 Jablochkoff candles installed 21 years ago in the Place de l'Opera at Paris were run on multiple circuits from three alternators (each with its own exciter), driven by three 20-horse-power engines. This meant 16 lamps per generator, while the earliest Brush arc dynamos built at about the same time were made for a single arc lamp, and the two-light and four-light machines which followed them had the lamps in multiple. Then when the series lamp was perfected, circuits of 12 to 18 lamps became common, and dynamos gradually increased in size up to the so-called 60-light or 50-kilowatt type, which for years has been the accepted unit. However, the development of much larger constant-potential generators and the evident increase in efficiency with the larger sizes stimulated the builders until we now have arc machines supplying as many as 150 of the 2,000-candle-power lamps or 200 of the 1,200-candle-power. Some of these are so arranged that the lamps, while all in series, are distributed over three circuits, so that the voltage on any one circuit is only about a third of the total. Meanwhile there have been great improvements in the alternating-current arc lamps, and the perfection of such lamps for use on series circuits seems close at hand. When it comes we shall be able to run both our arcs and incandescents from the same machine, so as to use the 200 or even 500-kilowatt generators (which already have reached such high efficiency) without needing the rectifiers now used to some extent in England for supplying current from alternators to arc lamps in series.

Incandescents for street lighting are usually connected in series across the primaries on the alternating generator, each lamp being provided with a suitable cutout device (either in the base of the lamp or in the socket) to automatically close the circuit when the filament gives out. An exception to this is the Westinghouse plan of having an inductive or so-called "kicking" coil in shunt with the lamp, the coil being of too high resistance to consume much current ordinarily, but which will offer an inductive counter-electro-motive force equal to the voltage of the lamp when the latter gives out.

The method of supporting the lamps varies from place to place, and, as a rule, has not had the proper amount of thoughtful attention paid to it. In the early days, when the number of arc lamps used was very small, these were put up on tall masts or towers so as to form an imitation moon, which was supposed to light a wide area. Such towers are still in use altogether at a number of places, and have also been retained in parts of other towns. They have the great advantage that they hold the lamp high enough not to glare into your eyes when walking toward them, but tall trees or buildings of any considerable height usually interfere with the distribution of light from them. Such towers generally had from two to six arc lamps each, and the next step was the placing of each of these lamps over a tall pole, so that the lamps could be distributed over the area to be lighted. The poles being set inside the curbing, brought the lamp so close to the line of the shade trees as to cut off most of the light from the walk on the nearer side. To overcome this, lamps were hung out at the end of iron mast-arms, these being 10, 12, 15, or even 20 feet long, and, as a cheaper substitute, the cross-suspension wire method was then introduced (though mast-arms can now be put up as cheaply as the cross-suspension). Each of these methods has given good average results, yet there have been objections to each when universally used.

For a wide distribution of light from a lamp, the latter ought to be not less than 30 feet above the street, hence the mast-arms or cross-suspensions were at first made to support the lamp over the center of the street and some 30 or 35 feet high. This brought the lamp above the foliage which shaded and darkened the walks; so that the lamps were lowered to the common height of only 18 or 20 feet, bringing them so nearly on a level with the eyes of teamsters as to seriously dazzle them when driving toward the lamp. Reducing the candle-power of the lamp reduces the intensity of this glare, so that a 340-watt or 240-watt lamp is less offensive than the 460-watt arc, and a 105-watt incandescent lamp still less so. (The energy required for the 460-watt arc will supply four or five incandescents scattered like our gas lamps, to give a more even distribution of lighting units.) Happily, the enclosing globes used on long-burning arcs are reducing the glare, and the same is true when ground, opal or fluted globes are used.

To sum up the changes in street lighting practice: Yesterday the cry was for large lamps and intensely bright illumination of some picked spots, regardless of the equally intense shadows intervening. To-day there is the tendency to have the rays of light overlap and to use lower candle-power lamps in the alleyways and other dark nooks and on the streets of the outlying districts. To-morrow we may look for smaller units and a great many more of them.

Yesterday the type of lamp and method of support, picked for the business district, was used throughout. To-day many towns use the bright display lighting only in the business section and a milder one for the residence portion. To-morrow we may look for a mild but uniform illumination, both for the residence district and for the business portion after midnight.

Yesterday the lower efficiency of the incandescent lamp kept it back. To-day our ability to distribute light more uniformly with the incandescents has caused them to be used in many places, and to-morrow we may look for small arcs or incandescents of higher temperature and, therefore, higher efficiency to bridge the gap.

Yesterday the naked arc, being all the more dazzling, was welcome. To-day enclosing globes are mellowing the effect on the eye. To-morrow the use of naked arcs out of doors and less than, say, 30 feet above the ground, ought to be prohibited by law.

Yesterday only large cities felt the need of street lighting. To-day even towns with a population of less than 1,000 have their streets electrically lighted.

Yesterday a thousand towns secured the advantages of electric light and power by giving lighting contracts at a fair profit to proposed plants. To-day the same towns begrudge the help they have given toward modernizing their city, hesitate to pay even the actual cost for lighting by contract, and make the central stations look to the sale of exhaust steam and like sources of extra revenue.

Yesterday towns were lighted either with arcs or incandescents. To-day both are used in the same city, each in its proper place. To-morrow we may have some lamps of intermediate candle-power (perhaps semi-incandescents of the Nernst or allied types) to supplement the arcs and incandescents.

Yesterday every circuit of one or two dozen arc lamps required its own generator. To-day we have from 100 to 200 run from a single generator, and to-morrow we may have 400 or 500 arcs (or the equivalent of part of them in incandescents) all run from the same alternator.

Yesterday a circuit of a thousand

volts was hard to insulate, and might have to be shut down during rainstorms. To-day we have circuits of 7,000 to 8,000 volts giving uninterrupted service, in spite of wind and weather.

Yesterday little attention was paid to the fittings as long as the lamps, dynamos and circuits were all right. To-day they must be firm and durable. To-morrow the lamps, supporting fixtures, and all parts of the circuit will need to be good-looking.

Last, but not least, electric street lighting has become an object of careful study and is receiving skilled attention. Yesterday the size and distribution of lamps and the methods of supporting them were determined chiefly by the salesmen of the firms supplying the material. To-day such organizations as the American Society for Municipal Improvements and the National Association of Municipal Electricians are making a serious study of street lighting in its general bearings and are getting back to due consideration of the prime objects of all street lighting—path finding and crime preventing. What is more, while some manufacturers and consulting engineers have made a specialty of long-distance power transmission, others of the lighting system for modern buildings, and still others of the applications of electric motors to special classes of machinery, we also have some who have been studying the problems of electric street lighting. It is only by such special study, both on the part of the engineers in charge of the work and of the makers of the needed devices, that we can expect to raise the present standard of effectiveness of our street lighting. And I think it is high time that both the general public and our electrical fraternity were made aware of the importance of these problems, so as to help us all in having electricity become by far the best means for properly lighting our outdoor pathways.

The Busy Advertisement.

[*From the Shoe Trade Journal.*]

An ad. in a trade journal will do what traveling men, as a rule, do not do. It will go to towns off from the railroad, where there are no hotels. It will work nights, Sundays and holidays, in wet weather or dry, hot weather or cool. It will talk to a merchant before some of the boys are out of bed in the morning and after they have gone to bed at night. It's one of the few things that has not as yet struck for eight hours.

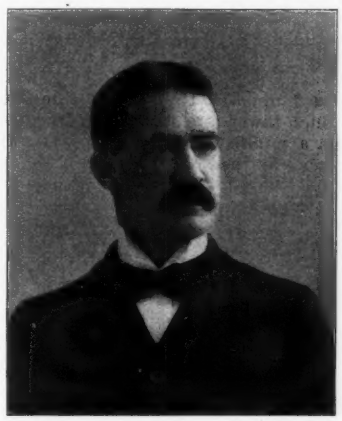
The Ontario Legislature proposes to make it incumbent upon all municipalities to first provide for the purchase of existing plants before the municipality may go into the lighting business itself. This would seem a just and equitable arrangement. Naturally, the municipal authorities are opposing the measure.

Mr. W. E. Baker.

The Manhattan Railway Company, of New York, has secured the services of Mr. W. E. Baker, formerly general superintendent of the Metropolitan West Side Railroad Company, of Chicago, as general superintendent.

Mr. Baker was born in Massachusetts 43 years ago, and was graduated from the school of engineering of Lafayette College in 1877. After a period of employment as a civil engineer on the St. Paul & Pacific, Northern Pacific and Canadian Pacific railways, he engaged in pioneer surveying work in the Rocky Mountains, later becoming resident engineer for the International & Great Northern Railroad in Texas.

Going to Boston in 1888, he associated himself with the Thomson-Houston company, and gained from this employment his first electrical experience. He gained most valuable experience in the equipment and operation of the great system of electric railways in Boston. This knowledge stood him in good stead in the construction and operation of the Intermural Railway of the World's Fair. Many of the salient features of this undertaking, including the largest motors and generators built up to that time, were worked out by Mr. Baker.



Mr. W. E. Baker.

His connection with the Chicago West Side system is responsible for the great excellence which has marked every department of that large electric elevated railway system. In New York he will take entire charge of the electrical equipment of the elevated lines, and will assist and advise Mr. Alfred Skitt, the vice-president and general manager of the Manhattan company.

Upon leaving Chicago Mr. Baker was tendered a farewell dinner by a number of his friends at the Union League Club.

The Warren, Ohio, Light Company is preparing to build a new plant to cost $40,000.

ELECTRIC LIGHT FLASHES.

The electric light plant in Mount Vernon, Ind., has been sold to Gonnerman Company, of that city.

The Edison Electric Light Company, at York, Pa., has sold its plant and franchises to an Ohio syndicate.

The Galesburg, Ill., Electric Illuminating and Power Company has sold its light and gas plant to a Portland, Me., syndicate.

The electric lighting plant at Manistique, Mich., will be greatly enlarged, the capacity being trebled. A stock company is now being organized to provide funds for the improvements.

Sheriff Van Buskirk, of Hackensack, N. J., has sold at public sale the Rutherford electric light plant under foreclosure proceedings instituted by the Franklin Trust Company, of New York, which held a mortgage of $37,000 on the plant.

A petition in involuntary bankruptcy has been filed by Thomas B. Shoaff, Myer Hellman and Sigmund Oppenheimer, of New York, against the People's Electric Light and Power Company, of Evansville, Ind., showing liabilities of over $90,000.

The plant of the Muscatine, Iowa, Electric Light and Power Company, operating the street railway, electric light and gas plants for the city, has been sold to Harry W. Huttig, general manager of the Huttig Bros.' Manufacturing Company. The plant is valued at $300,000.

The Sandusky, Ohio, Gas and Electric Company has been incorporated, with a capital stock of $500,000, to furnish gas for the lighting of streets and buildings and electricity for public and private lighting. The incorporators are Thomas B. Hoxsey, Clark Rude, Fred P. Hiltz, C. C. Warren and Frank Warren.

At the annual meeting of the Newtown, Pa., Electric Light and Power Company the following board of directors was elected: Ashbel W. Watson, George C. Worstall, George C. Blackfan, Edward H. Buckman, Thaddeus S. Kenderdine, Robert Kenderdine and William M. Watson. Ashbel W. Watson was subsequently elected president; Thaddeus S. Kenderdine, vice-president; William M. Watson, secretary, and Robert Kinderdine, treasurer.

The Westinghouse Electric and Manufacturing Company has filed bills in equity in the United States Circuit Court against the Lancaster Electric Light, Heat and Power Company, of Lancaster, Pa., asking to have the defendants enjoined from the making of alleged infringements on assigned patented improvements in systems of alternating-current regulation and distribution and assigned patented improvements in systems of electrical distribution.

The Wabaska, Neb., Electric Light Company, which furnishes light for that city and Blue Springs, is to be sold to a party of local capitalists, the consideration being $37,000. The new company intends building a power-house at Holmesville, five miles up the river, and the dynamos will be run by water-power. The operating expenses of the present plant are so high that the price charged for service is exorbitant, and many business men have taken their lights out. The local company proposes to enlarge the capacity of the plant and reduce the price.

A charter has been granted to the Lackawanna Valley Electric Light and Power Company, the purpose of which is to supply electric current for light, heat and power to the people of Carbondale, Pa., and adjacent towns. The capital stock of the company is $200,000. The stockholders are as follows: T. L. Newell, of Kingston, 660 shares; J. B. Russell, of Wilkes Barre, 660 shares: W. D. Boyer, of Scranton, 660 shares; Grant Bolton, of Scranton, 10 shares; G. M. Reynolds, of Wilkes Barre, 10 shares. These are independent of the Electric Trust, and it is said that their purpose is to begin to erect a plant and wires right away.

The Syracuse, N. Y., Electric Light and Power Company have decided to spend $200,000 in enlarging the plant. About $75,000 has been set aside for the erection of a building 200 feet front and the depth of the present building in Fulton street. The main object of the extension is to supply the demand for incandescent lights, and the additional machinery to be installed, which includes a 1,500 horse-power generator, will provide for 30,000 more incandescent lamps. The amount to be expended for machinery is about $100,000. The company's wires will be put under ground in streets in which there are subways in the Spring. Ornamental poles for lights which are to be located in the center of the city by the council, in addition to lights which are now in service in the business streets, are now on hand, and they will be placed in position along the curbs as soon as the wires are in the subways.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

GRINNELL, IOWA—The People's Telephone Company has been incorporated; capital stock, $100,000.

DECATUR, MO.—The Macon County Telephone Company has been incorporated; capital stock, $20,000; incorporators, H. M. Witmer, C. S. Hankins and W. P. Shade.

PINE GROVE, KY.—The Old Kentucky Telephone and Telegraph Company has been incorporated, with $5,000 capital.

LITTLE INDIA, ILL.—The Virginia & Little India Telephone Company has been incorporated; capital stock, $600; incorporators, Marquis L. Crum, Frank Virgin and L. L. Fox.

RISING SUN, IND.—Right-of-way for the building of the telephone line from here to Madison, via North Quercus Grove, East Enterprise, Allensville, Bennington, Moorefield and Brooksburg, has been secured by Green Brothers.

PITTSBURGH, PA.—The American District Telegraph Company of Pennsylvania has been incorporated; capital, $10,000; incorporators, Herbert D. Bennett, W. F. Burdell, both of Columbus, Ohio; A. M. Schoyer, R. O. Romsey, J. H. Harter, all of Pittsburgh.

CAMBRIDGE, OHIO—The Cambridge Home Telephone Company has been incorporated; capital, $15,000; incorporators, M. Hartley, C. C. Cosgrove, William Hoyle, J. McKitrick, T. M. Scott, all of Cambridge.

MINNEAPOLIS, MINN.—The Southern Electric Telephone Company has been incorporated; capital stock, $30,000; incorporators, D. N. Tallman, Willmar; Charles Webster, Wauconia, Iowa; David C. Jones, Minneapolis; Andrew Larsen, Willmar.

TAUNTON, MASS.—The Taunton Telephone Company has been incorporated; capital, $50,000; incorporators, Peter H. Con, Clinton Sproat, H. H. Shumway.

GAINES, PA.—The New York & Pennsylvania Telephone Company has just completed a long-distance line to this place, the center of the newly discovered oil territory.

BALTIMORE, MD.—The Rowland Multiplex Telegraph Company has been incorporated; capital, $5,000,000. Incorporators, John Gill, Alexander Brown, C. D. Fisher, Bernard N. Baker, Eugene Levering, Ira Remsen and F. H. Hamilton, all of Baltimore.

DELTA, PA.—The Delta Telephone Company has disposed of their plant and franchise to the Highland Telephone Company, of Harford County.

LAKEVILLE, N. Y.—The Sharon telephone people are being urged to extend their line from this place to Salisbury.

WOONSOCKET, S. D.—The Dakota Southern Telephone Company has been incorporated, with a capital of $50,000. Incorporators, Charles M. Hopkins, Gib Dziewanowski and Robert S. Vesey.

New Incorporations.

PORTLAND, ME. — The Williams Electric Deadlock Company has been organized at Portland for the purpose of manufacturing and dealing in electrical inventions with $2,000,000 capital stock. The officers are: President, Frederick Williams, of Revere, Mass.; treasurer, William A. Morse, of Tisbury, Mass.

NEWARK, N. J.—The Consolidated Street Car Company, with an authorized capital of $18,000,000, has been incorporated. The company is to manufacture rolling stock for street railways. The incorporators are William P. Chapman, Jr., New York; Albert G. Ridley, Brooklyn, and Francis D. Pollak, Jersey City.

MILWAUKEE, WIS.—The Milwaukee Electric Company has been incorporated with a capital stock of $40,000. President, William P. Harper; vice-president, Walter Cary; treasurer, John A. Whaling; secretary and engineer, Harry W. Morris. The board of directors consists of W. P. Harper, Walter Cary, John A. Whaling, John W. Suetterlee and A. B. Stetson. The company will manufacture motors, dynamos and other electric appliances.

POTSDAM, N. Y.—The Hannawa Falls Water-Power Company has been incorporated to develop power for manufacturing chemical and electrical purposes, through the construction of dams on the Racquette River; capital, $300,000; directors, Wm. B. Cogswell and John L. King, of Syracuse; Ogden H. Toppen and Edwin A. Merritt, Jr., of Potsdam.

JERSEY CITY, N. J.—The Sutherland Construction and Improvement Company, with a capital of $1,000,000, to construct, equip, improve, work, develop, manage, control or own public works and conveniences of all kinds, including gasworks, electric plants, power works, street and other railways and other works or conveniences of public use or utility, has been incorporated. Incorporators are Alexander M. Sutherland, East Orange, N. J.; William Minland, Oshkosk, Wis., and Ulysses S. Grant, New York.

NORTH PATERSON, N. J.—The Automatic Electric Valve Company has been incorporated. Incorporators are William G. Nixon, E. Augustus White, Alfred G. Sharkey and Robert W. Dunlap. The authorized capital is $100,000.

Increase of Capital.

DEFIANCE, OHIO — The Northwestern Telephone Company has increased its capital stock from $30,000 to $50,000.

ROMNEY, IND.—The Tippecanoe Telephone Company has certified to an increase of capital stock from $10,000 to $20,000.

Electric Light and Power.

MARSHFIELD, VT.—A stock company is being organized in this place, to be known as the Marshfield Power and Light Company, for the purpose of erecting an electric light plant at Mollie's Falls. The capital stock of the company has been placed at $5,000. The object of the company is to furnish light and power for that and adjoining towns.

DETROIT, MICH.—The Citizens' Light Company have been granted a franchise for electric transmission over the highways of the township of Otisco.

NEWARK, N. J.—William Browe & Son's Company has been incorporated; capital, $100,000; to do a general electric light business; corporators, Walter L. Browe, Geo. D. Browe, Charles F. Beers, James Perry.

BLOOMSBURG, PA. — An electric railroad will be built this Summer between this place and Berwick. President, Mr. Wm. McCarroll, of Philadelphia. The capital stock is $250,000.

SOUTH BETHLEHEM, PA. — The Nazareth & Bethlehem Passenger Railway Company, of which J. H. McGee is president, has secured the right of way in nearly all cases through private property, and will begin surveying and staking in a few days. This company proposes to build an electric road direct from Bethlehem to Nazareth.

AKRON, OHIO—The Akron Traction and Electric Company has been temporarily incorporated, with a capital stock of $100,000. The temporary organization is formed for the purpose of buying in the property of the Akron Street Railway and Illuminating Company, which was sold at receiver's sale March 28. The company will be reorganized with a capital stock of $2,000,000.

New Electric Railways.

KANSAS CITY, MO.—The Central Electric Railway Company has been incorporated: capital, $2,000,000; incorporated by D. B. Holmes, Frank Hagerman and H. C. Page.

NEW CASTLE, PA.—Capitalists of this city and property holders of New Wilmington are interested in the formation of an electric road between the two places. The distance is 10 miles, and the route of the proposed line has already been selected.

KANSAS CITY, KAS.—The Kansas City-Leavenworth Railway Company, capital, $1,000,000, has been chartered under the laws of Kansas to build an electric line from Kansas City, Kas., to Leavenworth, Kas., a distance of 26 miles. The line was projected by W. E. Winner, of Kansas City, who has secured the financial backing of Cleveland, Ohio, capitalists. Work on the road will, it is said, begin at once.

OSHKOSH, WIS.—The Citizens' Traction Company, of this city, has been incorporated, to build the interurban line to Neenah; capitalized at $500,000.

MILLBURY, MASS.—The Linwood Street Railway Company has been granted a franchise for an electric road between Linwood and Whitinsville, and the road will be opened for business during the coming Summer. Connections will be made at Whitinsville with the Worcester & Blackstone Valley Electric Railroad, and will give a through line of 18 miles to Worcester.

Motor-Carriage Exposition at Berlin.

There will be held at Berlin, Germany, from September 3 to 28, 1899, an international competitive exhibition of motor carriages, open to all exhibitors. Exhibits will be classified as follows:

a. Motor carriages and devices of all kinds for the transport of persons.
b. Motor wagons for transport of freight.
c. Motor cycles and trailers.
d. Motors and accumulators for motor carriages.
e. Parts and wheels for motor carriages.
f. All articles relating to motor carriages and not otherwise classified.

The exposition will be held in a covered building known as the Exercier-Haus, 34 and 35 Karl Strasse, which has a superficial area of 3,200 square yards. It will be open daily from 10 A. M. to 6 P. M. It is hoped that before the opening of the exposition the place will be provided with electric light, in which case the exposition will be continued until 9.30 P. M. daily.

A progressive series of tests, races, etc., is in contemplation, the programme for which will be announced by the committee of management at the opening of the exhibition.

The rent of exhibition space will be as follows: For the first 25 square meters of ground or wall space, 10 marks ($2.38) per square meter; for the second 25 square meters, 8 marks ($1.90) per square meter; for the third 25 square meters, 6 marks ($1.42) per square meter, and for all additional space accorded to one exhibitor, 4 marks (90 cents) per square meter.

Not more than two examples of the same class of exhibit will be permitted to each exhibitor.

Intending exhibitors should announce their exhibits as soon as possible, but not later than the 15th of April, either by letter or telegram addressed to the committee as follows: "Internationale Motorwagen Ausstellung Berlin, 1899, Berlin, Universität Strasse No. 1." With the announcement should be remitted half of the rental for the desired space. Applications for space received after the 15th of April, and not later than the 20th, will be accorded their due share of whatever space may remain unclaimed on the 15th.